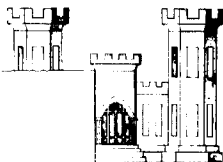
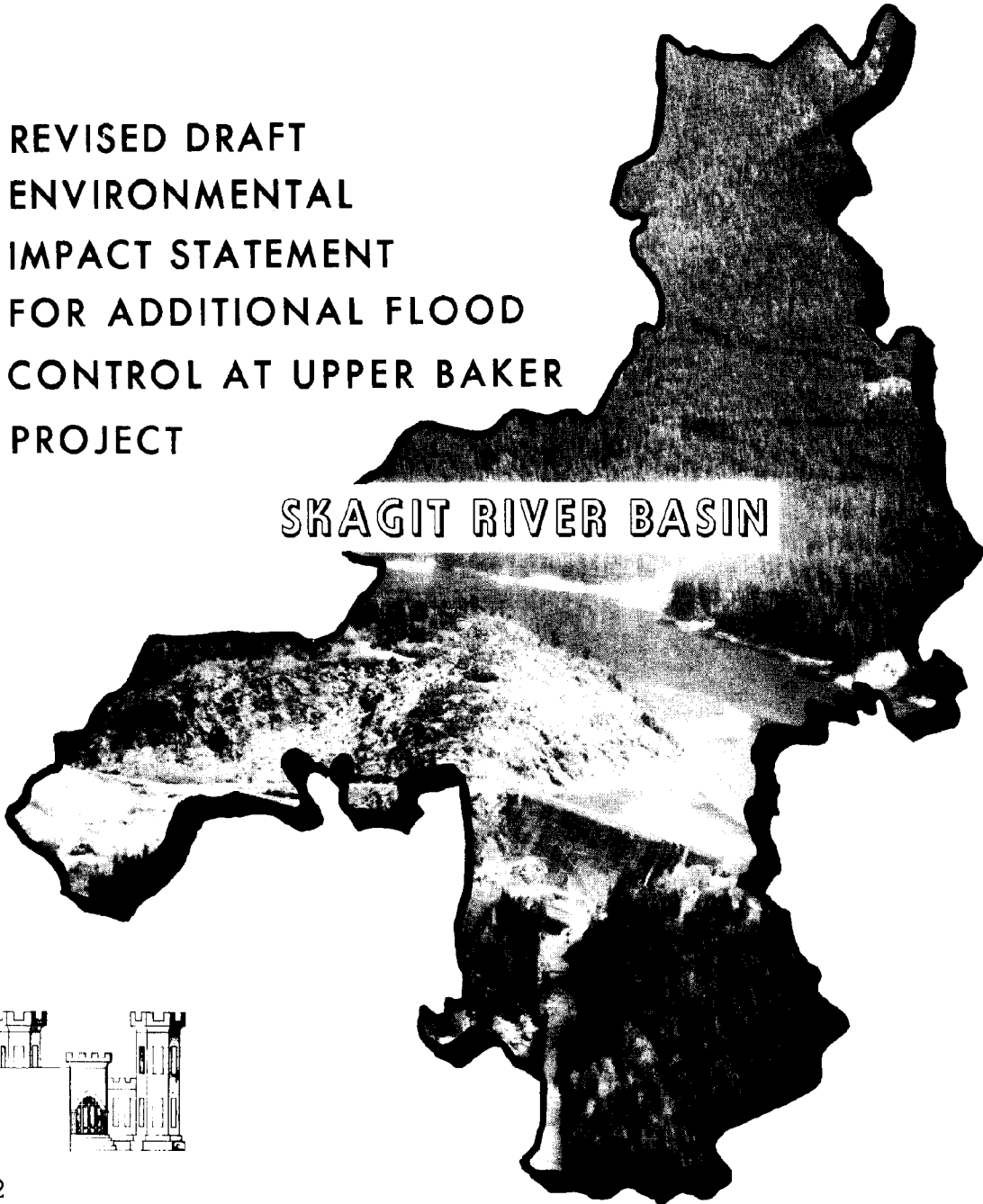


7603.22

PUGET SOUND AND ADJACENT WATERS WASHINGTON

REVISED DRAFT
ENVIRONMENTAL
IMPACT STATEMENT
FOR ADDITIONAL FLOOD
CONTROL AT UPPER BAKER
PROJECT

SKAGIT RIVER BASIN



TC
530
.A32
1975

OFFICE OF THE CHIEF OF ENGINEERS

DEPARTMENT OF THE ARMY, WASHINGTON, D. C. 20314

JUNE 1975

REVISED DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Additional Flood Control
At Upper Baker Project,
Skagit River Basin, Washington

Property of GOC Library

U. S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

Prepared by
U.S. Army Corps of Engineers District
Seattle, Washington

TC530. A32 1985
2973:320 NOV 18 1997

ADDITIONAL FLOOD CONTROL AT UPPER BAKER PROJECT,
SKAGIT RIVER BASIN, WASHINGTON

(X) Revised Draft Environmental
Statement

() Final Environmental
Statement

Responsible Office: U.S. Army Corps of Engineers District, Seattle, WA

1. Name of Action: () Administrative (x) Legislative

2. Description of Action: The Upper Baker Dam and Reservoir is an operating hydroelectric project on the Baker River in Skagit and Whatcom counties in Washington. The project is owned and operated by the Puget Sound Power and Light Company and is located about 8 miles above Concrete, Washington. The principal features of the Upper Baker Dam include: A concrete gravity dam about 330 feet high with a spillway crest elevation of 694 feet and containing some 600,000 cu. yd. of concrete; a powerhouse containing two 47,200 kW nameplate turbine generating units; a usable water storage capacity of 220,630 acre-feet between normal maximum pool elevation of 724 feet and minimum operating pool elevation of 655 feet. The project provides 16,000 acre-feet of flood control storage space from November through February. Drawdown for power generation has resulted in the past in Baker Lake falling below elevation 700 feet by the middle of January and occasionally by mid-December, and to 680 feet by February.

This environmental impact statement presents potential effects of a proposed modification in the operation of the dam for flood control purposes. The details of this modification concentrate on providing up to 58,000 additional acre-feet of flood control storage by increasing reservoir drawdown in the period 1 November to 15 November of each year. The pool elevation on 1 November would be about 720.6 feet or less depending upon power generator operation of Puget Power. By 15 November the pool will be required to be at or below elevation 707.8. The additional 58,000 acre-feet of flood control storage would be available until 1 March, then refilling would begin and would usually be completed by 1 April.

3. a. Environmental Impacts. The proposed action would provide additional flood protection in the Skagit River flood plain below Concrete by decreasing peak discharges over those now experienced. Flood frequencies would remain unchanged in areas protected by low levees; however, for major floods, the extent of flooding would be less. Environmental impacts associated with the project are expected to be minimal. As a flood threat would still remain, human occupation and development of flood-plain lands are not expected to increase significantly. Existing state laws and Federal policies governing development in flood hazard areas would still apply to lands within the 100-year flood plain. Costs of flood related community services should decrease somewhat. Agricultural

development of lands is not expected to increase because of greater flood protection. Other intangible effects include reduced probability of accidental death or injury due to flooding; and increased economic security of those now living within the flood plain.

b. Adverse Environmental Effects. Reservoir drawdown of about 12.8 feet from current flood control pool (elevation 720.6) will occur during the typical wet month of November, exposing additional shoreline earlier than in the past, thereby increasing the potential of erosion of lakeshore lands. Although this may create additional problems with lake siltation and turbidity, these problems are not expected to be great. Increased flood protection may create a false sense of security toward the remaining flood hazard. To the extent that this additional security results in increased flood-plain development, greater personal and economic losses could occur. Because of the increased use of Upper Baker Dam facilities for flood control, some net power losses will occur in the future. These losses are small when compared to the total production in the Bonneville system. However, net losses which do occur will be experienced during the winter season when peak energy demand is at its highest, thereby contributing to a small degree to anticipated future power shortages forecast for the Pacific Northwest. The small amount of power production foregone by implementing the proposed action would contribute cumulatively to future power shortages which may justify construction of new generating facilities.

Replacement power will be provided from the Pacific Northwest Federal hydroelectric system to Puget Power through power in kind transfers by the Bonneville Power Administration (BPA). Revenues foregone by the BPA as a result of power transfer would be considered a nonreimbursable Federal flood control cost, to be deducted each year from the reimbursable (power) operation and maintenance account of the Chief Joseph Dam, Lake Rufus Woods, Washington, project. In this way, BPA will be compensated for the Federal power revenue forgone.

4. Alternatives. Alternative 1 - Do Nothing; Alternative 2 - Flood Plain Management Alone; and Alternative 3 - Flood Plain Management with Additional Flood Control Storage at the Upper Baker Project. In addition, variations of the proposed plan were studied and are discussed in this statement.

5. Comments Received. Copies of the draft environmental statement were sent to some 32 agencies and possibly interested parties on 26 February 1975. An announcement of availability was sent to other interested parties on 21 February 1975. A news release was sent to the media on 19 February 1975 stating the availability of the draft environmental statement. Written comments were requested from the following agencies, groups and individuals. Those commenting on the draft EIS are marked with an *.

a. National

- *Federal Power Commission
- Office of Economic Opportunity
- *United States Forest Service
- Federal Highway Administration
- *Environmental Protection Agency
- Federal Energy Office
- National Marine Fisheries Agency
- *Department of Commerce
- *Department of the Interior
- *Department of Housing and Urban Development
- *Fish and Wildlife Service
- *Advisory Council on Historic Preservation
- *Bureau of Reclamation
- *Department of Agriculture

b. State

- *Office of Program Planning & Fiscal Management
- *State of Washington
- University of Washington
- Small Towns Institute
- Office of Community Development
- Puget Sound Air Pollution Control Agency
- Eastern Washington State College
- *Western Washington State College, Huxley College

c. Local

- *Skagit Regional Planning Council
- Watcom County Planning Department
- Port of Skagit County
- Skagit County Public Library

d. Others

- Washington Ecological Commission
- Friends of the Earth
- Mrs. Stanley Engle
- Mr. John W. Slipp
- Ms. Nancy Thomas
- Sierra Club
- *Audubon Society
- Association of Northwest Steelheaders
- Ms. Liz Greenhagen
- *Washington Environmental Council

6. Draft Statement Submitted to CEQ on: 10 February 1975
Revised Draft Statement Submitted to CEQ on: 3 MAR 1976
Final Statement Submitted to CEQ on: _____

UPPER BAKER LAKE FLOOD CONTROL
STORAGE PROJECT, CONCRETE, WASHINGTON

TABLE OF CONTENTS

	<u>Page</u>
Summary	i
Table of Contents	vi
Figure 1	121
Plates 1 and 2	122

<u>Section No.</u>	<u>Title</u>	<u>Page</u>
1.0	Project Description	1
2.0	Environmental Setting Without the Project	4
3.0	Relationship of the Proposed Action to Land-Use Plans	31
4.0	Environmental Impact of the Proposed Action	34
5.0	Unavoidable Adverse Environmental Impacts	44
6.0	Alternatives to the Proposed Action	45
7.0	The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity.	53
8.0	Irreversible and Irretrievable Commitments of Resources Which Would Be Involved Should the Proposed Action Be Implemented.	54
9.0	Coordination With Others	55

1.0 Project Description

1.1 The Baker River, (Plate 1) a tributary of the Skagit River is located in the northwest portion of the State of Washington and traverses Whatcom and Skagit Counties. The Baker River originates in the glaciers of Mount Challenger, in the Picket Range east of Mount Baker and Mount Shuksan. It flows mostly southwest and enters the Skagit River at the town of Concrete, Washington.

The Upper Baker Hydroelectric Project, (Plate 2) completed in June 1959, is owned and operated by Puget Sound Power and Light Company. It is located about 8 miles above Concrete and involves a drainage area of 210 square miles. The reservoir, formed by a concrete gravity dam with a spillway crest elevation of 694 feet, provides a usable storage of 220,630 acre-feet between normal maximum pool elevation of 724 feet and minimum operating pool elevation of 655 feet. Its dead storage, below elevation 655 feet, is 64,800 acre-feet. The surface area of Baker Lake at normal maximum pool elevation is 4,985 acres. The pool elevation is now held below 720.6 feet during the winter flood season to provide 16,000 acre-feet of flood storage required by the Federal Power Commission as replacement for natural valley storage lost when the Baker Lake reservoir was created. Maximum drawdown from normal full pool is 69 feet. However, the maximum normal drawdown is usually less than 50 feet. Baker Lake usually is lowered to elevation 700 feet by mid-January and sometimes as early as mid-December due to the need for hydroelectric power generation. The installed nameplate capacity of the project is 94,400 kW.

1.2 Proposed Action. The Seattle District, U.S. Army Corps of Engineers, has selected Alternative 3, Flood Plain Management with additional Flood Control Storage at Upper Baker Project shown on page 49 of this document, as the recommended plan. Alternative 3 proposes that up to 58,000 acre-feet of additional flood storage space at the Upper Baker reservoir be provided during the winter flood season by holding the reservoir below elevation 707.8 feet, except when actually controlling a flood. Provisions for this additional flood storage are included in the terms and conditions of the project's Federal Power Commission (FPC) license. This additional storage would be available during the flooding period from 15 November to 1 March of the following year, with the additional drawdown for flood control to begin on 1 November of each year. Following the flood control storage period, reservoir refilling can begin with refilling target date 1 April (see figure 1). However, as the refill depends on weather, snowpack, rainfall and power load, refilling in some years might be completed later than the target date. No reservoir drawdown for flood control is contemplated during the summer season.

Flood-plain regulation by Skagit County is included in this alternative. Federally subsidized flood insurance is now available to Skagit County residents. Under the proposed plan of operation with additional flood control storage, space at Upper Baker Project would be utilized to increase protection to the lower Skagit area during major floods. Flood control regulation would begin when unregulated flow on the Skagit River at Concrete is forecast to exceed 90,000 c.f.s. Some minor flooding which is known to occur at lesser flows would not be affected by flood control regulation at Upper Baker project. However, the level of protection to the city of Mount Vernon would be increased such that safe channel capacity in this area would be exceeded an average of about once in 15 years rather than once in 10 years without Upper Baker storage. For 10-, 25- and 50-year floods, the discharge at Mount Vernon will be reduced by about 12,000, 15,000 and 18,000 c.f.s. respectively. Although the severity of flooding will be reduced, the duration of the flood will be slightly increased as the stored floodwaters are released from the Upper Baker project after the river has peaked. For example, a flood under existing conditions that takes a total of 48 hours to recede below the zero damage level would take approximately 56 hours with the Baker Lake Storage project in operation.

The flood protection offered by the proposed action is in agreement with Skagit County's flood plain management objectives as outlined in the Comprehensive Land-Use Planning Alternatives for the Skagit River Flood Plain and Related Uplands, prepared by the Skagit Regional Planning Council, April 1973. This subject is discussed in greater detail in section 3 of this environmental impact statement.

1.3 Project Authorization. Studies conducted of additional flood control at Upper Baker Project were in follow-up to the Comprehensive Water and Related Land Resource Study of Puget Sound and Adjacent Waters, Washington. The comprehensive and detailed project feasibility studies were authorized by the Flood Control Act of 1962, Section 209, Public Law 87-874. The comprehensive study, initiated in 1964 and completed in 1971, identified early action needs of the Puget Sound area for water and related land resource preservation, conservation, and development. Additional flood control storage at the existing Upper Baker River project, constructed by Puget Sound Power and Light Company (Puget Power) in the interest of hydroelectric power generation, is an early action element of the comprehensive plan. The comprehensive plan was submitted to Congress by the U.S. Water Resources Council through the President's Office of Management and Budget in July 1974.

1.4 Project Benefits and Costs. Average annual flood damages without the project for a 100-year period 1977-2077 are estimated at \$4,766,000. Of this amount, the proposed flood control project would prevent annual damages estimated at \$1,127,000. Estimated annual costs for

the flood control project include interest charges, annual costs of operation and maintenance, and costs of replacement of an equivalent amount of power because of the use of a portion of Upper Baker storage for flood control purposes rather than power generation.

An interest rate of 5-7/8 percent and an analysis period of 100 years have been used in the projection of benefits and costs. Annual charges and benefits are listed below:

<u>Average Annual Benefits</u>	<u>100 Year Analysis</u>
Flood damage reduction	\$1,127,000
<u>Average Annual Costs</u>	\$434,000
<u>Benefit/Cost Ratio</u>	2.6 to 1

2.0 Environmental Setting Without the Project

2.1 The Baker River, from its start in the glaciers of Mount Challenger in the Pickett Range, flows southwest to its confluence with the Skagit River at Concrete, Washington. The Baker drains some 298 square miles, and has a mean annual flow of 2,663 c.f.s. at Concrete, Washington. Maximum flood of record occurred on the Baker in 1962, with a flow of 36,600 c.f.s. Rocky, Sulphur, Boulder, and Park Creeks, which originate on the east slopes of Mount Baker, and Swift Creek, originating from the west side of Mount Skuksan, are the major tributaries to Baker River.

2.2 The Skagit River, with its principal tributaries of the Sauk, Baker, and Cascade Rivers, and Thunder Creek, comprise the major waters of the Skagit-Samish River basins. The Skagit River originates in Canada, flows southwesterly about 163 miles to Skagit Bay on Puget Sound draining 3,105 square miles, including 400 square miles in Canada. Maximum flood of record for the Skagit occurred in November, 1909, with a peak discharge of 260,000 c.f.s. at Concrete, and 220,000 c.f.s. at Sedro Woolley.

2.3 The Skagit Basin is bounded on the north by the Nooksack-Sumas Basins and Canada, on the south by the Stillaguamish and Snohomish Basins, on the east by the crest of the Cascade Mountain Range, and on the west by Samish, Padilla, and Skagit Bays, arms of Puget Sound.

2.4 The Skagit flood plain includes the entire floor of the Skagit River valley, the deltas of the Samish and Skagit Rivers, and reclaimed tidelands. The almost 100,000 acres of flood plain below the Baker River includes a broad delta downstream of Sedro Woolley. The valley upstream from Sedro Woolley is narrow and relatively undeveloped although farms and vacation cabins are scattered along the flood plain. In this Upper reach, about two-thirds of the bottom land is uncleared or occupied by river channels and sloughs. The valley varies in width from less than 1 mile in the upper reaches to about 2 miles at Sedro Woolley, then opens into a broad delta outwash plain more than 15 miles wide (plate 1).

2.5 Existing Flood Control. Presently, there are seven dams located on the Skagit River System. Ross, Diablo, and Gorge on the Upper Skagit River are owned and operated by Seattle City Light. The Upper and Lower Baker River Dams are owned and operated by Puget Sound Power and Light Company. The Lone Star Cement Company owns two small power dams on Bear Creek; however, these structures are no longer in operation.

The Ross and Upper Baker Dams and Reservoirs in conjunction with channel improvements and a levee system are the only structures providing flood control for the Skagit River basin. Ross Dam controls about 30 percent of the basin's runoff with 120,000 acre-feet of

storage space reserved for winter flood control. The Upper Baker Reservoir has a flood storage capacity of 16,000 acre feet as required by its FPC license to compensate for natural channel storage lost by construction of the dam. The Baker River dams do not contribute to dependable flood control beyond the 16,000 acre-feet reservation. Flooding recurrence of the Skagit River under present conditions with existing flood control projects can be expected to occur on an average of every 3 years.

2.6 Developments in the flood plain include all or portions of the towns of La Conner, Conway, Mount Vernon, Burlington, Sedro Woolley, Hamilton, Rockport, and Marblemount.

2.7 Geologic Setting. The mountainous region of the Upper Skagit Basin consists of ancient metamorphic rocks, largely phyllites, slates, shales, schists and gneisses together with intrusive granitic rocks and later andesitic lavas and pyroclastic deposits associated with Mount Baker and Glacier Peak. The valleys are generally steep sided and frequently flat floored. Valley walls are generally mantled with a mixture of rocky colluvium and to considerable elevation by deposits of continental and alpine glaciation. These deposits are a heterogeneous mixture of sand and gravel together with variable quantities of silt and clay depending on mode of deposition. The valley floor flood plain of the Skagit below Concrete is composed of sands and gravels diminishing to sands silts and some clays downstream. Below Hamilton, fine grained flood plain sediments predominate. The valley of Baker River in the vicinity of the reservoir is geologically significantly different from most of the other Skagit tributaries. This is largely due to the influence of Mount Baker and volcanic cone rising to elevation 10,778 feet immediately northwest of the valley. The last dated major eruption, about 10,000 to 12,000 years ago, poured a lava flow down Sulphur Creek blocking the Baker Valley. Subsequent cutting of the narrow canyon through this lava flow provided the site for the Upper Baker Dam. Subsequent volcanic activity, as recent as 200 years ago, has resulted in flows of hot ash, debris and mud being discharged down tributary valleys into the Baker Valley. The result is a variable mantle of volcanic pyroclastic and debris flow materials overlaying glacial deposits on the west side of the valley. Evidence of continued volcanic activity is seen in an increase in geothermal activity in the summit crater early in 1975. The east side of the reservoir largely consists of a mantle of glacial deposits and colluvium over slates and shales. Some of the glacial deposits are silts and sands deposited in a glacial lake environment.

2.8 Vegetation. The upper Skagit Basin is forested predominately with dense stands of conifers typical of the Western Cascades and includes Douglas fir, mixed with cedar and hemlock. A portion of the lower basin lies within the boundaries of the Mount Baker-Snoqualmie National Forest, while the upper basin is within the North Cascades National Park. The lower elevations of the Skagit valley are forested primarily by red alder, cottonwood, and maple. The understory

consists primarily of vine maple and other shrubs, vines, and herbs, with salal, huckleberry, trailing blackberry, thimbleberry, boldhip rose, salmonberry, snowberry, broken fern, sword fern, and Oregon grape occurring in the more open areas.

2.9 The climate of the Skagit Basin is classified as midlatitude, West Coast, marine. Due to its location on the windward slopes of the Cascade Range, the area around Baker Lake is dominated by marine influences throughout the greater part of the year. The climate is characterized by heavy rain and snow during the late fall, winter, and early spring. The average annual snowfall varies from 525 inches at Mount Baker lodge to 5.6 inches at Anacortes. The total annual precipitation varies from 103 inches at Mount Baker lodge to 27 inches at Anacortes, but averages about 45 inches at Sedro Woolley. The average high temperature is 60° F and the average annual low is 41° F. The mean length of the growing season is 193 days.

2.10 Fisheries and Wildlife Resources. The Baker River drainage includes the Baker River, Lake Shannon, Baker Reservoir, and several tributary streams, which along with lands within the drainage area support a wide variety of fish and wildlife. Fish resources of the basin include resident rainbow, cutthroat and brook trout; whitefish, kokanee, and Dolly Varden. Anadromous species include chinook, coho, sockeye, pink, and chum salmon, steelhead and searun cutthroat trout. Rainbow trout, planted in Baker Lake by Puget Power, support a put-and-take type fishery. Kokanee, Dolly Varden, rainbow, and cutthroat trout are all present in Baker Lake as self-sustaining populations. Kokanee are the most important species present in that they sustain the largest naturally-produced harvest. Dolly Varden are harvested in smaller numbers but achieve "trophy size" and are specially sought after by some anglers. Self-sustaining rainbow and cutthroat populations are small and contribute little to overall harvest. Puget Power, in cooperation with Washington Department of Fisheries, maintains an anadromous fish collection facility at Concrete. During the 1972-73 collection period, nearly 14,400 salmon were captured, trucked, and released into Baker Lake and adjoining artificial spawning beaches. They consisted of 10,000 sockeye, 4,000 coho, 250 chinook, and 30 chum. In addition, 50 steelhead trout were captured and released. The Washington Department of Fisheries maintains artificial spawning beaches at the mouth of Channel Creek at the upper end of the reservoir. These beaches provide spawning habitat for 3,000 sockeye salmon to make up for the natural spawning lost as a result of construction of Upper Baker Dam. To pass juvenile fish downstream, the Baker project uses a fish attraction barge, which starts operation in March. Puget Power also maintains a trout stocking program to enhance Baker Lake sport fishing.

The waters of the Baker drainage are extremely clean and provide an excellent habitat for fish rearing. Little rock flour from melting glaciers enter the Baker River, since the glaciers feeding it lie on the east side of Mount Baker and receive little direct

sunlight during the hot summer months. The spawning provided by Baker Lake tributaries and artificial spawning beaches contributes to the sport and commercial fisheries of the Pacific Ocean, Puget Sound, and the Skagit River. Although Baker Lake provides an excellent environment for fish rearing, sockeye salmon spawning in lake areas is usually not successful because of receding lake levels. Fish prefer spawning areas in tributary streams. Table 1 gives fish landings and value of the catch in 1973 (the most recent data available) for sport and game fisheries in the Skagit River:

TABLE 1
FISHERIES AND WATERFOWL

<u>Specie</u>	<u>Number of Fish Caught</u>	<u>Unit Value</u>	<u>Total Value</u>
Sport fishery:			
Chinook	1,881	\$20	\$37,620
Coho	1,161	20	23,220
Pink	9,255	20	185,100
Jack(1 & 2 yr. old Chinook or Coho)	1,655	20	33,300
TOTAL	13,962	20	\$279,240
Game fishery:			
Steelhead	16,729	\$80	\$1,338,320

SOURCE: Washington State Department of Fisheries.

Comparable figures are not compiled for other resident game fish such as trout, whitefish or Dolly Varden.

The only commercial fishery on the Skagit River is an Indian fishery which began in 1974. Table 2 gives fish landings and value for this fishery:

<u>Specie</u>	<u>Number of Fish Caught</u>	<u>Unit Value</u>	<u>Total Value</u>
Chinook	1,433	\$19.42	\$27,829
Chum	4,573	11.09	50,715
Sockeye	729	5.77	4,206
Coho	8,306	8.67	72,013
	15,041		\$154,763

SOURCE: Washington State Department of Fisheries.

The chief big game mammals of the basin are elk, deer, black bear, mountain goat, and cougar. Deer, and occasionally black bear and cougar, occupy the lowlands. Rabbits and snowshoe hare are the common small game mammals, and mink, muskrat, otter, beaver, marten, weasels, skunks, bobcat, fox and coyote are the common furbearers. Numerous other mammals commonly found in the basin include raccoons, porcupines, opossums, squirrels, chipmunks, moles, voles, shrews, mice, and bats.

The chief upland game birds of the basin are blue, ruffed, and spruce grouse, and band tailed pigeon. Waterfowl are numerous, but are much more prevalent in the lower basin. Waterfowl species include mallard, bufflehead, scoup, ruddy, widgeon, swans, ducks, and Canada and snow geese. Numerous species of song birds, shore birds, and raptors are also present. Some of the more notable raptors are bald and golden eagles, osprey, red-tailed hawks, and great horned, barn and shorteared owls. In addition, it has been reported that Osprey nesting occurs near the east shore of Baker Lake, near Silver Creek. Table 3 gives number of waterfowl caught and value for the Skagit River-Baker Lake area for 1973, which is the most recent information available:

TABLE 3

<u>Specie</u>	<u>Number of Waterfowl Caught</u>	<u>Unit Value</u>	<u>Total Value</u>
Duck	114,170	\$11.58	\$1,322,089
Geese	5,160	11.58	59,753
TOTAL	119,330	\$11.58	\$1,389,842

SOURCE: Washington State Department of Game.

Reptiles and amphibians include western gartersnake, several species of lizards, tailed and northern tree frogs, and several species of salamanders.

Recent steam venting activity on Sherman Peak, west of Baker Lake, may be causing increased acidity levels in Boulder Creek, a tributary for Baker Lake. Recent water quality studies taken at the mouth of Boulder Creek by the U.S.G.S. revealed a pH reading of 3.5, or highly acidic, whereas most streams in the Baker Lake area yield readings of 6.5 to 7.0, or neutral to slightly alkaline. Water with a pH of 3.5 can be compared to vinegar.

Although waters with such high concentrations of acid are lethal to fish and other aquatic organisms, Forest Service personnel report that there has never been evidence of fish production in Boulder Creek. Personnel from the Washington State Department of Game report that the impacts of Boulder Creek water to fishery production in Baker Lake are probably minimal or nonexistent. This is attributed to greater levels of dissolved minerals in Baker Lake waters, thereby acting as a buffer to acid entering it.

2.11 Historical and Archeological Significance. There are no nationally recognized historical sites on lands surrounding the project area. ^{1/} There are no known archeological sites in the vicinity and because the elevation of the lake would not be increased by the proposed modification, no archeological field studies are contemplated.

2.12 Recreation. Recreational development around Baker Lake includes four developed Forest Service campgrounds and 12-14 undeveloped sites, a Puget Power campground, and a commercial resort. Puget Power and the Forest Service estimate that 222,000 people visited the Baker River drainage area during 1972. Although Puget Power's developed campground was not officially open during 1972, it was full of campers nearly every weekend throughout the summer months.

Skagit County is a popular tourist and recreational attraction as well. Along with other counties in northwestern Washington State, it shares the impressive Cascade Mountain Range. Portions of the North Cascades National Park and the Glacier Peak Wilderness are located in eastern Skagit County, and the principal access is through the Skagit River valley. Its economic potential has yet to be realized, but the recent completion of the North Cascades Highway, which opened hitherto inaccessible natural attractions, should be a major stimulant to tourist and recreational activity in the county.

In addition, the Skagit River itself, famed for steelhead fishing, and the position of Skagit County as the point of departure by ferry (from Anacortes) to the San Juan Islands make the county important to vacationers. The islands of Skagit County, which include Fidalgo, Guemes, and Cypress, are a part of the San Juan archipelago. Fidalgo Island, connected by a bridge to the mainland, has experienced considerable recreational development in the past decade with land and marina development at Skyline representing a major investment.

For the most part, however, the potentials for Skagit County tourist and recreation have not been developed, but given the rural character of this region and its impressive natural endowments, the opportunities for future development are considerable.

Baker Lake is a popular and much used fishing area. The 1971 Baker Lake Creel Census, taken from 1 July to 6 September 1971 reported on estimated catch of 9,826 rainbow trout from a plant of

^{1/}National Register of Historical Places, Federal Register, Tuesday, February 19, 1974, Volume 39, Number 34, Part 11, p. 6477; and personal communication with Mr. David Hansen, Washington State Office of Archaeology and Historic Preservation, 15 May 1975.

55,000 catchable-size fish, 10,658 Kokanee and 1,524 miscellaneous species. This total catch of 21,998 fish represented some 25,538 man hours of fishing during the census period, with the average angler fishing about 2.94 hours. The census further estimated that 2.73 fish were caught per fishing trip, with 1.21 rainbow and 1.40 Kokanee average catch per trip.

2.13 Land use with associated water requirements in Skagit County changes from sparsely habitated in the area around Baker Lake and associated uplands, to scattered structures in agricultural areas, to moderately intense urbanization on the valley floor. The primary land use is forests, with about 90 percent of the total county put to this use. Agriculture and urban land uses occupy 5 percent and 1 percent of the land, respectively.

Table 4 below displays the general land use pattern by activities for the majority of Skagit County.

TABLE 4 1/

<u>Use</u>	<u>No. of Units</u>	<u>Percent of All Units</u>	<u>Acres</u>	<u>Percent of Acres</u>
Residential	15,565	89	9,488	1.71
Community	322	1	1,052	.18
Commercial	1,249	7	814	.44
Industrial	220	1	954	.17
Transportation	--	--	6,483	1.17
Forest	--	--	426,088	77.10
Agriculture	--	--	106,760	19.31
Parks	--	--	955	.17
Totals	17,336	100	552,595	100.

1/Data conforms to the Skagit River flood plain and related uplands (east of the Swinomish Slough). Data obtained from: Comprehensive Land Use Planning Alternatives for the Skagit River Flood Plain and Related Uplands, Skagit Regional Planning Council, Mount Vernon, Washington, April 1973.

Continued development of the county is expected, especially by construction of residential housing.

2.14 Housing. The following summary of housing characteristics for Skagit County is based on information presented in Comprehensive Land Use Planning Alternatives for the Skagit River Flood Plain and Related Uplands, 1973. Of the 19,575 dwelling units located in Skagit County in 1970, 17,185 (approximately 88 percent) were occupied. The average value of the owner-occupied units was \$17,775. The average monthly rental was \$76. Approximately 89 percent of the dwelling

units were classified as sound; approximately 8 percent were classified as deteriorating; and approximately 3 percent were classified as dilapidated. There are 716 mobile homes used as dwelling units within the county. The Skagit Regional Planning Council predicts that within the next 20 years approximately 2,084 new dwelling units (10.6 percent increase) will have to be constructed.

Within the flood plain area, the single-family dwelling unit is the primary residential structure. This trend is expected to continue unless altered by one or more of the following factors: (1) increased use of mobile homes as permanent residential structures; (2) expanded development of multifamily residential structures; and (3) the increased use of planned unit development versus conventional subdivisions. All future home construction within the 100-year flood plain will be subject to the Washington State Flood Control Zone of 1975. As land prices escalate, it can be assumed that there will be increased use of high density developments. However, the offsetting factor in the flood plain area is the seeming abundance of vacant and hence potentially developable land. There will most likely be a slow continuation of the diversification of housing types within the flood plain. Demand for rural and ranchette as well as townhouses and garden apartments is expected to continue, especially near urbanized areas, and lakes and shorelines within the flood plain.

Flooding in this area adversely effects the quality and dollar value of housing available. Floodwaters rarely carry entire houses off their foundations; however, significant damage such as shifting and settling of foundations, damp rot in timbers, buckling of floors and walls, shorting of electrical systems, rusting of tools and appliances, and the soiling of furniture, rugs and draperies often results from flooding. The home owner must spend funds which might have otherwise gone for home improvements on costly flood damage repairs.

2.15 Socio-Economic Characteristics. The Skagit Basin's economy may be typified as essentially resource oriented. There are no significant major employers in the commercial, industrial, wholesale, or retail facilities in the county. Agriculture, logging, and fishing industries, the "mainstays" of the economy, have either been stagnant in terms of employment or have declined. The service sectors of the economy, however, have shown employment gains; most notably in the trade and government services sectors. The following paragraphs treat the socioeconomic environment in detail.

2.16 Population. Although Skagit County has grown in past decades, the rate of growth in recent years has been slower than that of counties in the central part of Puget Sound. Population trends for the basins and its cities and towns are shown in table 5.

TABLE 5

Population Trends

Area	1940	1950	1960	1970	% Change 1940-1970	Annual Average Change 1940-1970
Skagit County	37,650	43,270	51,350	52,380	38%	1.1
Anacortes	5,880	6,920	8,410	7,700	31%	0.9
Mount Vernon	4,280	5,230	7,920	8,800	105%	2.4
Sedro Woolley	2,950	3,300	3,700	4,600	56%	1.5
Burlington	1,630	2,350	2,970	3,140	95%	2.2
Concrete	860	760	840	570	-33%	(-1.4)

Figures from U.S. Census Reports.

The county on a whole increased its population from about 38,000 in 1940 to about 52,400 in 1970, a gain of about 38 percent. Over the period 1960-1970, the population increased by over 1,000, representing an average annual increase of about .2 percent. In 1970, 46 percent of the population was classified as urban while 53 percent maintained a rural type of existence, representing a 10 percent increase in the urban population since 1950, and a 10 percent decrease in the rural population over the same time period. The most notable features of population migration for the basin are seen in a persistent pattern of out-migration of young adults and the unpredictable in-migration of agricultural labor during the summer harvest seasons. Population projections completed by the Skagit Regional Planning Council indicate that the Skagit Basin will continue to grow at a leisurely pace in the future, with projections ranging from .2 percent to 1.0 percent per year.

Of the total 1970 Skagit County population, 98.1 percent was white. The nonwhite total increased only slightly from the previous decade and has deviated only .4 percent since 1940. Out of the total 1970 minority population of 1,011, 650 were American Indian, 182 were Mexican-American, 134 were Oriental, and 45 were Black.

The average age of the population of Skagit County has increased in the last decade (1960-1970), while the number of children under 5 years of age has decreased. This is probably attributable to the declining birth rate. Of the total county population, 35 percent is over 45 years of age. Only 29 percent of the state population is over 45 years of age. The recent decrease in the ratio of younger county residents to older may have contributed to the decrease in the rate of population growth for the county.

There has been a slight increase in the number of deaths in Skagit County over the last 10 years, due largely to the increased numbers of older people being attracted to the county because of its popularity as a retirement community.

Past records of net migration, indicating the balance between migrants in and migrants out, further explain the recent slowing of population growth in Skagit County. Between 1940 and 1950 the county experienced a net migration of 3,348 people. Between 1950 and 1960 there was also a plus net migration of 2,269. However, between 1960 and 1970 Skagit County experienced a net migration of minus 2,271. This loss of population to other areas over the past decade is probably due to the attraction of employment opportunities elsewhere compared to those available in the fairly static agriculture and extractive resource base of Skagit County.

It is difficult to do more than speculate as to impact of flooding on past and future net migration. Although the 1951 flood caused the most extensive and severe damages experienced by communities within this flood plain over the last 52 years (see page 40), there is no indication of a resulting outmigration for either the county or the incorporated communities directly affected. However, the current low level of flood protection may discourage immigration because of the constraints it presents on new developments.

Although the threat of a flood may not entirely discourage new development of areas within the flood plain, it does limit the amount of attractive adjacent land available to a community for expansion. Communities which are located entirely within the flood plain such as Hamilton are less likely to attract new residents than those only partially within the 100-year danger zone such as Sedro Woolley.

2.17 Employment. Employment by industry sectors is shown in table 6 for 1958 through 1971.

TABLE 6

LABOR FORCE AND EMPLOYMENT IN SKAGIT COUNTY FOR SELECTED YEARS

	1958	Annual Average		1971
		1963	1968	
Civilian Labor Force	21,090	19,460	21,790	23,340
Unemployment	2,050	1,650	1,610	3,160
Percent of Labor Force	9.7	8.5	7.4	13.5
Employment	19,040	17,810	20,180	20,180
Agriculture	3,280	2,780	3,380	3,280
Non-Agricultural	15,750	15,030	16,800	16,900
Employer, own account, unpaid, and domestics	2,910	2,970	3,000	2,970
Wage and Salary Workers, Non-Agricultural	12,840	12,060	13,800	13,920
Total Manufacturing	3,760	4,070	4,280	3,510
Food and Kindred Products	1,090	1,060	1,020	670
Lumber and Wood Products	1,200	1,330	1,360	1,210
Printing, Publishing, and Allied Industries	80	90	70	--
Stone, Clay and Glass Products	140	150	190	80
Miscellaneous Durable Goods <u>1/</u>	350	530	650	540
Miscellaneous Non- Durable Goods <u>2/</u>	900	910	990	1,010
Forestry, Fishing, Mining, and Miscellaneous	170	220	150	180
Contract Construction	1,900	630	770	860
Transportation, Utilities, and Communications	750	670	650	670
Wholesale/Retail Trade	2,320	2,210	2,820	3,070
Finance, Insurance, and Real Estate	290	310	360	420
Services	1,240	1,150	1,330	1,450
Government	2,410	2,800	3,440	3,760
Educational Services	840	1,060	1,300	--
All Other Government	1,570	1,740	2,140	--

1/Includes fabricated metal products, machinery, transportation equipment, and other durable goods manufacturing.

2/Includes chemicals and allied products, paper and allied products, petroleum refining, and other nondurable manufacturing.

Source: Washington State Employment Security Department.

The basic activities in the county, agricultural and processing of agricultural products, forestry, and lumber production, and in much smaller numbers fishing, mining and petroleum refining, are reflected in the employment distribution. Also significant but not separately identified is the amount of employment generated by the recreational and tourist industry. Over the past decade, employment in Skagit County has grown slowly, certainly not rapidly enough to provide job opportunities commensurate with an expanding population. Compared to Washington State's civilian labor force in 1970, Skagit County's labor force was a smaller percentage of total population (37.7 percent), composed of more males (64.6 percent) and had a lower median family income (\$9,407). Generally, the economic status of the county is below that of Washington State. Despite net out-migration of population, unemployment rates in Skagit County have been high throughout the decade. The best year was 1968 when the unemployment rate was as low as 7.4 percent. Contributing to high unemployment rates is the seasonal nature of the basic industries, but rates of unemployment in recent years (1973 average was 10.1 percent) reflect depressed market conditions as well as a tendency for population growth to outrun the creation of new jobs. In August of 1973, Northern State Hospital in Sedro Woolley was closed and thus eliminated employment of its average work force of 650. This contributed to a recent increase in the county unemployment rate of 13.1 percent 1/ in April 1974.

Agricultural employment, the "main-stay" of the county economy, has been declining over recent years, in line with national trends. Within manufacturing, employment in food processing and stone-clay-glass has declined sharply, reflecting closure of the cement plant at Concrete in 1969, but employment in lumber and wood products has maintained its levels. There have been significant increases in employment in nonmanufacturing jobs, particularly in trade, Government, and services. However, total employment in Skagit County has grown only 6 percent during the past decade, in contrast to an increase of 26 percent statewide.

2.18 Income. Total personal income, an indicator of the magnitude of economic activity in an area, was \$204.1 million in 1971 in Skagit County. This represented a 263 percent increase from the 1950 total of \$56.3 million, an average annual increase of 3.6 percent when converted to constant dollars. The State of Washington experienced a smaller increase of 259 percent during this same time period. In 1971, Skagit County contributed 1.4 percent of the total personal income in Washington State, and this percentage has remained constant since 1950. In 1971, per capita personal income for Skagit County was \$3,859, a 198 percent increase over the \$1,297 attained in 1950. The state registered a 149 percent increase in per capita personal income from 1950 to 1971. In 1971, per capita income in Skagit County was \$310 below that for the state. Table 7 shows total personal

1/Washington State Employment Security Department.

TABLE 7

TOTAL PERSONAL AND PER CAPITA PERSONAL INCOME FOR
SKAGIT COUNTY - 1950, 1965, 1970 and 1971

	Total Personal Income (millions of current dollars)				Per Capita Personal Income (current dollars)				Percentage Change 1950-1971
	1950	1965	1970	1971	1950	1965	1970	1971	
Washington	\$3,995.0	\$8,652.0	\$13,730.0	\$14,349.0	\$1,674	\$2,616	\$4,022	\$4,169	149%
Skagit County	56.3	132.1	188.0	204.1	1,297	2,682	3,585	3,859	198%
Skagit County as a percent of Wash.	1.4%	1.5%	1.4%	1.4%	77%	103%	89%	93%	-

Source: U.S. Department of Commerce, Computer listing of Total and Per Capita Personal Income for SMSA's and non-SMSA Counties of Washington; U.S. Department of Commerce, Survey of Current Business, August 1973.

income and per capita personal income for the state and county for the years 1950, 1965, 1970 and 1971.

Skagit River flooding appears to have only a minimal impact on the employment and income of flood-plain residents. Temporary unemployment may occur during or shortly after flooding, until recovery operations have been completed.

2.19 Population, Employment and Income Projections. Future economic growth in Skagit County should remain below that of Washington State. Per capita incomes should also be below the State average due to the seasonability of the dominant industries in the county - agriculture, food processing and lumber and wood products.

The Skagit Regional Planning Council has projected future population growth to continue much as it has in the past with long-range estimates (20+ years) varying between .2 to 1.0 percent per year. Given the growth potential for Skagit County in the fields of tourism and recreation as a complement to its agricultural-extractive resource base, it is not surprising that the principal components of economic growth projected are in finance, services and related activities. Over the 100-year study period, the largest absolute increases in Skagit County employment are expected in the trade, finance, service and Government sectors.

The areas within the Skagit River flood plain expected to be most affected by the projected county population increase are Mount Vernon, particularly eastward, and Sedro Woolley. The Skagit Regional Planning Council feels that the direction of future growth in the flood plain will be largely determined by the extent to which local officials implement such flood-plain management measures as agricultural zoning, 1.0 acre minimum lot restrictions, and flood zone restrictions. If such planning devices are utilized major portions of the south Skagit flood plain may become less important as extensive residential sites. However, depending upon the degree to which portions of it are not threatened by flood and not limited to agricultural use this area could assume a higher proportion of people in the future. If the planning measures mentioned above are not utilized, the Council expects that areas such as those lying west of Mount Vernon and west of Burlington could grow, causing a split in the agricultural land and increasing the danger of flood damage to both life and property.

The North Cascades Park could stimulate growth in the area near the upper Skagit River. However, it is assumed that this will take place in the form of temporary or second home, rather than permanent full-time residences. Therefore, such growth would probably be only seasonal. The central flood plain including the towns of Hamilton and Lyman, is too far removed from the North Cascades Park to benefit significantly from a tourism increase. This area will probably continue to decrease in population.

2.20 Forest Resources. Forestry continues as a major industry of the Skagit Basin, supporting several large saw mills, two plywood mills, and a pulp-paper mill. In 1960, timber harvest in Skagit County was about 178 million board feet, of which about 84 million board feet came from privately-owned lands. By 1972, log production increased to 297 million board feet, 156 million board feet of which came from privately-owned land. This large increase is attributed in part, to the harvesting of second growth Douglas fir and hemlock on private land. Most of the log cut is moved by truck to pulp and lumber mills in Everett and Bellingham. In Skagit County the "value added by manufacturing" from lumber and wood products manufacturing was \$12,100,000 in 1967. Forest resources are relatively unimportant in the Skagit River flood plain.

2.21 Mineral Resources. There are a wide variety of mineral resources in Skagit County, but only a few have been developed commercially. In 1970 the value of mineral production amounted to only \$1.4 million, down from the \$3.5 million production in 1960. This reduction is the result of a major cement establishment in the town of Concrete ceasing operations in 1969. The principal minerals extracted (in order of importance) currently are olivine, sand and gravel, stone, and soapstone. Very rich deposits of limestone and olivine are found in the upper Skagit Valley, and one of the few commercial strontium deposits in the United States is found near La Conner on Fidalgo Island.

2.22 Agricultural Resources. Agriculture is the leading economic activity in the area, and forage production in support of a dairy industry is the largest type of farming. The rich delta area of the Skagit River accounts for 90 percent of the nation's supply of cabbage seed and about 50 percent of the nation's beet seed, as well as significant amounts of turnip and rutabaga seed. The climate is very mild in the western portion of the county and the land is fertile and highly productive. The bottom lands of the Skagit River flood plain require ditching and diking due to their close proximity to saltwater. Further up the Skagit River the land becomes less fertile and the variety of agricultural products grown is limited. Most of the farms are in the fertile Skagit River delta. The number of farms in Skagit County has been decreasing while the average farm size has been increasing. The total percentage of land in use for farms has been decreasing. Although the amount of lands being farmed has decreased, the market value of all agricultural products sold has increased 65 percent from 1959 to 1969. The market value of all agricultural products sold in 1969 was \$26 million. Over half of the total value was from livestock, poultry and their products, followed in importance by crops. Vegetable farming has been increasing, due to pressures for greater and more intensive utilization of land, and there has been a diminution in the numbers of animal stock. Table 8 summarizes some measures of agricultural activity over the past decade. When tidal dikes in the delta are breached, the resulting saltwater intrusion reduces productivity of temporarily inundated areas from

TABLE 8
SKAGIT COUNTY FARM INCOME AND SALES
FOR 1969 AND 1959

	<u>1959</u>	<u>1969</u>
Market value of all agricultural products sold	\$15,890,942	\$26,234,667
Average value per farm	8,953	24,985
Crops including nursery products and hay	N/A	11,937,541
Specialty forest products	(1964) 83,989	19,696
Livestock, poultry and their products	9,167,984	14,277,430
Value of dairy products sold	(5,550,915)	(8,781,893)
Poultry products sold	(1,575,773)	(1,596,635)
Livestock and livestock products sold other than dairy	(2,041,296)	(1,805,482)
	<hr/>	
	Head	Head
Cattle and calves	41,160	37,038
Milk cows	16,367	13,274
Hogs and pigs	620	162
Sheep and lambs	1,527	354

Source: Washington State University, College of Agriculture, Skagit County Agriculture: An Economic Mainstay, 1972, p. 4.

1 to 3 years. Existing crops in the flood plain affected by flooding are bulbs, hay, raspberries, strawberries, seed grass, and winter barley. Bulbs contributed to over half of the monetary crop damage caused by past flooding, and in 1969, the market value sold totaled \$959,000. Average annual damages of \$1,843,000 (1974 prices and conditions), are experienced by agricultural areas within the flood plain. Although acreage devoted to agriculture in Skagit County will probably lessen in the years ahead, the future of the industry is assured by rising productivity and by the proximity of the county to the expanding urban centers around Puget Sound.

2.23 Manufacturing activity in Skagit County is primarily associated with the processing of the natural resource products in the area. Total manufacturing employment was 3,510 in 1971. The principal activities are lumber and wood products and food processing. In constant dollars, value added by manufacturing for Skagit County increased at an annual rate of 3.6 percent between 1958 and 1972 compared to a constant dollar annual increase of 2.7 percent for the state over the same period. Manufacturing of lumber and wood products has been a mainstay of the economy in Skagit County, and in 1970 represented 37 percent of the total manufacturing employment. ^{1/} The impact of forest products on Skagit County is further indicated in the 1974 edition of the Directory of Washington Manufactures which shows that of the 107 manufacturing firms in the county, 45 percent are in lumber and wood products.

Damaged machinery and business interruptions are the two outstanding types of losses experienced by manufacturing plants due to flooding. Flood waters also damage foundations, superstructures, improvements and decorations of buildings, office furnishings and records, stocks of raw materials and finished goods, outbuildings, vehicles and grounds.

2.24 Retail sales in Skagit County increased at an annual rate of 2.3 percent between 1954 and 1967, when measured in constant dollars. During this same time period, retail sales for the State of Washington rose at an average annual constant dollar rate of 3.3 percent. Mount Vernon, which is partially located in the flood plain, is the center of retail trade for Skagit County and in 1967 accounted for 46 percent of total retail sales for the county. Portions of Mount Vernon and Burlington are located in the flood plain and have experienced rates of growth in retail sales between 1963 and 1967 equal to or slightly greater than that for Skagit County. Retail sales for Washington, Skagit County, Mount Vernon and Burlington are shown in table 9.

2.25 Other Services. The normal complement of community services such as hospitals, nursing homes, a community college, financial

^{1/}Washington State Employment Security Department.

TABLE 9
RETAIL SALES
WASHINGTON AND SKAGIT COUNTY 1954-1967
(1967 \$)

	\$1,000				Average Annual Increase
	<u>1954</u>	<u>1958</u>	<u>1963</u>	<u>1967</u>	<u>1954 - 1967</u>
Washington	\$3,569,789	\$3,947,526	\$4,408,527	\$5,465,566	3.3 %
Skagit Co.	68,578	75,942	79,669	91,917	2.3 %
Burlington	N/A	N/A	9,640	11,094	-
Mt. Vernon	N/A	N/A	35,634	42,397	-
Mt. Vernon as a percent at Skagit Co.	-	-	45%	46%	

Source: U.S. Department of Commerce, Census of Business, 1954, 1958, 1963, 1967.

institutions, libraries, hotels, motels, schools, and churches, are available in Skagit County. As with most other economic activities, the financial and service centers for Skagit County are located in Mount Vernon. A community college, which draws students from all areas of the state is located in Mount Vernon. In 1967, receipts from services totaled \$6.5 million in the county, \$2.9 million, or about 44 percent in the city of Mount Vernon. As shown in table 10, sales of selected services in constant dollars increased at an average annual rate of 3.6 percent between 1954 and 1967. During this same time period, sales of selected services for the State of Washington rose at an average annual constant dollar rate of 4.9 percent.

2.26 Education in the study area is conducted under the general supervision of Intermediate School District 108 (ISD 108), headquartered in Bellingham. ISD 108 is a four county organization which encompasses the school districts of Whatcom, Skagit, Island and San Juan Counties.

TABLE 10
SELECTED SERVICES
WASHINGTON AND SKAGIT COUNTY 1954-1967
(1967 \$)

	\$1,000				Average Annual Increase
	<u>1954</u>	<u>1958</u>	<u>1963</u>	<u>1967</u>	<u>1954 - 1967</u>
Washington	\$407,962	\$504,534	\$589,065	\$766,956	4.9 %
Skagit Co.	4,101	5,559	6,332	6,519	3.6 %
Burlington	N/A	N/A	377	429	-
Mt. Vernon	N/A	N/A	2,619	2,877	-
Mt. Vernon as a percent at Skagit Co.	-	-	41%	44%	

Source: U.S. Department of Commerce, Census of Business, 1954, 1958, 1963, 1967.

There are a total of 25 schools within the study area; consisting of five high schools, two junior high schools, and eighteen elementary schools. On a rating system ranging from first to third class (with first class signifying the fulfillment of highest reviewing standards), Conway is the only third class district in the study area. La Conner is a second class district and the remaining districts, Sedro Woolley, Burlington-Edison and Mount Vernon are all first class districts. These school districts provided education for a total of 9,764 students in 1970 ranging in level from kindergarten through twelfth grade.

Nearly all public school districts in Skagit County are experiencing a diminishing rate of growth in so far as student population is concerned. This is primarily a result of two unrelated events: (1) birth control is overcoming the cyclic effect of the World War II "baby boom" and (2) there is an outmigration of young adults and their families from the flood plain to other urban centers.

This diminished rate of growth is allowing school districts to reduce student per classroom ratios thus reducing the demand for additional classrooms. Nevertheless, nearly all school districts within the flood plain are near 100 percent capacity and some are presently housed in substandard buildings.

The Skagit Valley College campus covers an area of 85 acres on the northeast edge of Mount Vernon. A Whidbey Island Branch of the college was created in September, 1970, as a cooperative endeavor of the college and the Naval Air Station in Oak Harbor. The Whidbey Branch is located on the Navy Sea Plane Base.

Skagit Valley College is accredited by the Northwest Association of Secondary and High Schools and approved by the Washington State Department of Public Instruction and the Veterans' Administration. The district that the college now serves includes Skagit, Island and San Juan Counties. It is financed by state and Federal funds and by student fees. Total enrollment for the winter quarter of 1973 was approximately 4,200.

Schools within the flood plain lose classroom time during a flood, and the following cleanup period along with the funds which must be appropriated to flood damage repair. Teachers and administrators must also assume responsibility for the students in the event of a severe flood.

2.27 Police and Fire Protection. The Skagit County Sheriff Department is the largest law enforcement agency in the county with a staff of 29 commissioned personnel. It assumes a great deal of the police protection responsibility within the county, including almost all criminal investigative work. Burlington, Sedro Woolley, Mount Vernon and La Conner have city police departments with a total of 33 sworn-in officers. The remaining eight communities within the 100-year flood plain are under the jurisdiction of the County Sheriff Department.

The fire insurance ratings for the six incorporated towns within the flood plain range from four (Mount Vernon) to six, on a scale from 1 to 10; (signifies ideal conditions). The unincorporated towns are rated either seven or eight due to the lack of water supply systems for fire fighting purposes.

In areas threatened by high probabilities of flooding, police and fire departments must answer to increased demand for services under handicapped conditions. Rescue operations during a flood are hampered by inundated roads. Often times there is the threat of looting when people are forced to evacuate homes and businesses. Floods also promote fire by dislodging tanks and spreading oil and gasoline, by hampering the work of fire fighting units, by closing down water pumps, by damaging electrical and heating systems, and by disrupting sprinkler systems.

2.28 Transportation. The Burlington Northern Railroad system serves Skagit County with a Seattle to Vancouver, B.C. mainline through Mount Vernon and Burlington. Another line crosses western Skagit County with facilities in Sedro Woolley. A branch line services the upper valley. Greyhound Bus Lines have a scheduled system with a bus station in Mount Vernon. Interstate 5 is the principal north-south highway. State highways running east and west afford access to all cities and villages within the county. The construction and design of the highways is semi-adequate for present useage according to the Skagit Region Planning Council. State and private roads allow access to the more remote regions.

The majority of aircraft based in this area are light and privately-owned. There is no scheduled air traffic. Local air traffic is of a sightseeing and flight instruction nature, and is greatest during the tourist season. Lower and upper valley landing facilities offer near complete air traffic coverage of the valley. Bay View Airport has the greatest potential for future development as a commercial air traffic operation center.

Barge and freight operations are centered in La Conner and at a sparce assortment of individual industrial locations. Accesses to Puget Sound Ferry systems are through Anacortes and Whidbey Island.

Roads, railroad tracks and air landing strips are often inundated by floods in the study area. The resulting transportation tieup is compounded by an increased number of persons attempting to evacuate the area during a flood and the increased need for supplies and aid units to be transported into the area. Following flooding, interruptions in normal transportation continue while facilities are being repaired.

2.29 Water and Sewage. Essentially all water used for consumption, agricultural, sewage disposal and industrial purposes within the flood plain originates in watersheds located in Skagit County and Mt. Baker -Snoqualmie National Forest. In addition to indeterminate amounts of water from wells, the major source of water is the Skagit River and its tributaries. The average daily flow of water on the Skagit River at Mount Vernon is approximately 10 billion gallons per day. Abundant water is located on or close to the ground surface, making it possible to deliver water throughout the flood plain at nominal cost since neither extensive pumping nor lift stations are required.

According to the 1970 revised edition of the Overall Economic Development Plan for Skagit County, sewage facilities are desperately needed in this area. Existing lines and treatment facilities are presently inadequate to handle existing demands. City and county groups are currently trying to determine how to support the full-time industry required to build adequate sewage systems in this area of low population density and a relatively high tax structure.

During severe flooding municipal or private water supplies may become contaminated due to inundated sewage systems and septic tanks. Until the necessary repairs are made, residences and businesses in the area are without sanitary water supplies and waste disposal facilities. Not only does this interrupt the production of goods and services within the area, it also poses a serious health threat.

2.30 Health Services. Approximately 42 physicians and 28 dentists practice in towns within the flood plain. The majority of these have practices in Mount Vernon with a substantial number in Burlington and Sedro Woolley. Two hospitals service this area. United General Hospital, near Burlington has 98 beds and had an average occupancy 50 percent during 1973. Skagit Valley Hospital has 129 beds and had an average occupancy rate of 68.5 percent in 1973. Both hospitals provide general medical and surgical services including emergency and intensive care.

According to the Skagit County Health Department, flooding has not seriously affected public health in the flood plain area. However, the rushing waters of a severe flood constitute a life-threatening situation. Photographs taken of the 1951 flood damages show farm building which were totally destroyed by flood waters. According to local newspapers, an entire house near Conway was swept off its foundation. No deaths were associated with these events. However, hundreds of residents were forced to temporarily evacuate their homes and take refuge in nearby public and private buildings. The adverse effects of crowding, compounded by the absence of normal sanitary conditions such as adequate cooking, washing and toilet facilities increases the probability of transmitting infectious disease among flood refugees. The ability of hospitals and health professionals to deliver normal health care services is inhibited during flooding by inundated roads and crowded facilities. After cresting, receding floodwaters deposit several inches of mud which dries to dust over the flood plain. This can irritate respiratory ailments for months following.

2.31 Institutional Dynamics. Flood-plain management, flood protection and warning, along with emergency relief involve a number of governmental, volunteer and private agencies ranging from the local to the national level. The following summarizes the interactions of the major concerned institutions with each other and with the flood-plain residents, and how these interactions affect current social economic flood-plain conditions.

The five incorporated towns within the flood plain (Mount Vernon, Burlington, La Conner, Sedro Woolley, Hamilton and Lyman) have mayor-council city governments. Burlington and La Conner have planning councils but contract with the county for the issuance of building permits and building inspection. Sedro Woolley also has a planning commission and issues building permits. Lyman and Hamilton do not have planning commissions. Unincorporated communities within the

flood plain are under county jurisdiction. Skagit County has formal building codes and zoning ordinances.

The city and county governments having jurisdiction over the flood-plain areas contribute significant amounts of time, effort and money to flood related problems. Currently, these government bodies are dealing with flood-plain management measures. During and after flooding, they are involved in assisting in the appropriation and utilization of flood relief funds.

Skagit County presently has a form of flood-plain management through an amendment to the Interim Zoning Ordinance #4081. This ordinance is very similar to State Regulations WAC 508.60 and RCW 86.16 except with reference to flood frequency and floodway concepts. Also, the state regulations prohibit structures used for permanent human habitation, or uses associated with high flood damage potential within the floodway. The County Ordinance does not make such restrictions.

Present state and county regulations raise the cost of new development in the flood-plain area through requirements for flood proofing. By requiring flood proofing, the cost of developing the flood plain is transferred from the public to the private sector.

The Washington State Flood Damage Relief Council was founded in 1934 as the Puget Sound Flood Control Council with the intent of providing a place where common flood related problems could be discussed, information exchanged, and recommendations formulated for presentation to the Legislature for state flood control programs. After renaming the council The Washington State Flood Control Council in 1957, there was a shift in emphasis from structural solutions to other alternative methods in reducing flood damages. This shift was partly due to changes in Federal and state program emphasis on the efforts of individual government agencies to a combined, cooperated effort of all levels of government with the local government taking the initiative in creating long-range flood damage reduction programs. Recommendations made by the council to the Governor and Director of the Department of Ecology suggested statewide planning of flood damage reduction projects, better coordination of local projects and the use of techniques other than structural as a solution to flood damage reduction.

The United States Water Resources Council prepared flood guidelines for Federal agencies in response to Executive Order #11296. These guidelines were published in May 1972. The idea behind the guidelines is not to eliminate all development of the flood plain, but to discourage those developments which: (1) Could cause substantial damage (i.e., gas stations, log dumps), (2) could cause substantial loss to the owner and/or community (small business, county courthouse), and (3) could create a danger to human life

(residential areas). Open space uses could most compatibly exist in high flood frequency locations. These uses may range from outdoor theaters to farmlands. These types of open space uses, with limited permanent investment, are capable of being flood proofed, and do not contribute greatly to down-river damages.

2.32 Flood Characteristics. The Skagit River system produces more runoff than any other river basin in the Puget Sound area. Average annual runoff exceeds 12,000,000 acre-feet per year at the Mount Vernon gage. The Baker River watershed produces an equivalent of 1,929,000 acre-feet per year with an average discharge of 2,660 c.f.s. at the Concrete gage.

The Skagit River and all of its major tributaries usually have low flows during August and September after the snowpack has melted and the ground-water flow has been partially depleted. With the occurrence of heavy precipitation in the fall and winter, the rivers experience a temporary flow increase. Discharges usually rise through October and reach a peak in November on the Baker and upper Skagit Rivers. Winter flow peaks are typically delayed until December on the Sauk and lower Skagit Rivers, but the Cascade normally has its greatest flow in October. From their winter peaks, the rivers drop to intermediate lows in February or March when temperatures are normally low. During these months, heavy precipitation normally replenishes the snowpack at high elevations from late fall through March. Although annual peak discharge is usually the result of winter rains, in some years the peak occurs during the spring snowmelt.

The Skagit River valley has had a history of flooding dating back before 1900. Floodflows have been recorded intermittently since October 1908. Zero damage flow is considered to be 60,000 c.f.s. at Concrete. The flood of February 1951 had a peak discharge of 139,000 c.f.s. at Concrete, 150,000 c.f.s. at Sedro Woolley, and 144,000 c.f.s. at Mount Vernon. The flood remained near its peak for 6 hours at Mount Vernon, a fact which contributed significantly to the severity of flood damages. During this flood many dikes failed, because they lacked sufficient cross-sectional dimensions to withstand saturation. Table 11 lists flows above 60,000 c.f.s. at the Concrete gage.

The principal flood problems are in the section of the Skagit flood plain west of Sedro Woolley. This section comprises 75 percent of the flood plain. The present levee system in this area varies in level of protection provided, with safe channel capacity (2-foot freeboard allowance) ranging from 84,000 to 130,000 cubic feet per second, representing 3- and 11-year average recurrence intervals, respectively. Flood stages capable of doing major damage usually occur in the fall and winter months.

TABLE 11

<u>Date</u>	<u>Peak Discharge</u> (c.f.s.)	<u>Date</u>	<u>Peak Discharge</u> (c.f.s.)
30 Nov. 1909	260,000	3 Dec. 1943	65,200
30 Dec. 1917	220,000	8 Feb. 1945	70,800
13 Dec. 1921	240,000	25 Oct. 1945	102,000
12 Dec. 1924	92,500	25 Oct. 1946	82,200
16 Oct. 1926	88,900	19 Oct. 1947	95,200
12 Jan. 1928	95,500	27-28 Nov. 1949	154,000
9 Oct. 1928	74,300	10-11 Feb. 1951	139,000
26 Jun. 1931	60,600	1 Feb. 1953	66,000
27 Feb. 1932	147,000	3-4 Nov. 1955	106,000
13 Nov. 1932	116,000	20 Oct. 1956	61,000
22 Dec. 1933	101,000	20 Apr. 1959	90,700
25 Jan. 1935	131,000	23-24 Nov. 1959	89,300
3 Jun. 1936	60,000	16 Jan. 1961	79,000
19 Jun. 1937	68,300	20 Nov. 1962	114,000
28 Oct. 1937	89,600	22 Oct. 1963	73,800
29 May 1939	79,600	21 Jun. 1966	72,300
2 Dec. 1941	76,300	28 Oct. 1967	84,200

Existing protective works on the Skagit River System are composed of levees, which prevent water from flowing over land during low stage flood flows, and bank protection which prevent bank erosion and the destruction of levees. The present levee system extends along both banks of the north and south forks from their mouths to the junction forming the Skagit River. Continuous levees extend up the main Skagit River Channel past Mount Vernon to a point just above Burlington on the right bank and about 1/2 mile above the Great Northern Railway bridge between Mount Vernon and Burlington on the left bank. A levee on the right bank (facing downstream) extends about a mile downstream from Hamilton. The entire city of Burlington relies on levees for flood protection. Conway, west Mount Vernon, the central business district of Mount Vernon, and residential areas to the south are protected by levees. In all, the levee system on the Skagit protects about 46,000 acres of valley land or less than 50 percent of the flood plain.

2.33 Flood Damages. Over the recent past, the flood damage potential has been increasing in areas upstream of Sedro Woolley as much of the river shoreline has been particularly attractive for summer home developments. Many of these developments are located on reaches where the riverbank is low, resulting in damages from bank erosion, and from overtopping of low riverbanks and low levees. The greater part of past flood damage has been to land and crops in the lower valley. Major damage results from the drowning of grasses and other plants, loss of livestock, sheet erosion caused by overflow of

unprotected ground, leaching of fertilizer, infestation by weed seed, carrying away of fences, the deposition of sand, gravel, and driftwood, temporary loss of pasture because of ground saturation and loss of land through streambank erosion. Additional damage is caused to buildings and their foundations as well as damage to the contents of commercial inventories from businesses in the flood plain. Average annual flood damages in the Skagit basin have been projected to run about \$4,331,000 by 1977 under 1974 prices. Future average annual damages over the period 1977-2077 and based on 1974 dollars, without additional flood protection can be expected to increase to \$4,766,000.

2.34 Sediment Transport. The Skagit River transports about 10 million tons of sediment a year, based on average streamflow. Observations carried out near Mount Vernon during 1965-1966 noted sediment concentrations of from 19 to 655 p.p.m. Based on a river discharge of 70,000 c.f.s., a daily suspended sediment load of about 640,000 tons can be expected.

Reservoirs on the Skagit system tend to reduce total sediment concentrations; much of the sediment in the Baker River, for instance, is deposited in Baker Lake and Lake Shannon. Much of the eroded sediments in the Upper Skagit Basin are trapped in Ross Lake.

The most serious sediment problems are found in the Upper Skagit basin, due to the natural glacier erosion from the vicinity of Glacier Peak.

2.35 Bank Sloughing. Landslide activity and erosion are common occurrences on slopes which are filled with extensive fine grained unconsolidated deposits. Oversteep slopes in glacial deposits frequently fail by slumping, by slump-earthflow landsliding, and by calving of steep sloped reservoir walls. These occurrences are especially common in reservoirs with large fluctuations in pool levels.

Little or no sloughing appears evident along the west side of Baker Lake, due to the relatively flat slopes in the Volcanic deposits on this side of the valley. Where glacial deposits mantle bedrock on the east side of the valley, especially where the deposits are fine grained, slough and side activity is more evident.

The U.S. Forest Service has reported conditions of considerable bank sloughing in the Anderson Creek area of Baker Lake during the past few years. In addition, minor sloughing has been reported in isolated areas between Anderson and Wilker Creeks, on the east side of Baker Lake, about 1 mile upstream of the damsite. The last major landslide activity in these areas occurred in 1969 and evidence suggests that it may have been triggered by a change in drainage patterns caused by a Forest Service road built further up the slope from the reservoir.

2.36 Geothermal Activity. Recent steam-venting activity on Mount Baker and the formation of a small lake in Sherman Crater have resulted in renewed concerns over the possibility of avalanches or mudflows sliding down the east side of Mt. Baker into Baker Lake.

Sherman Peak, which forms part of the rim of Sherman Crater, is adjacent to Boulder Glacier which leads down to the Boulder Creek Valley. The end of the glacier is about 6 miles from Baker Lake. Speculation has recently been increasing that with the ponding of water in Sherman Crater, huge mudflows could result if the water was suddenly released by rock which has deteriorated from the effects of centuries of heat and water.

Avalanches of snow, firn, rock, and mud have been fairly common occurrences in the Sherman Peak area in past years. Frank, et al, ^{1/} have observed that avalanches have occurred at least six times since 1958, and other research has found evidence of at least two major mudflows from Mount Baker that reached what is now Baker Lake within the past several hundred years.

In the report, past avalanche activity on Sherman Peak is attributed to three conditions: A large accumulation of snow; rock broken down hydrothermically into a slippery, clay-like material; and excessive water saturating these materials as a result of summer heat or geothermal melting. Frank states that based on past experience, a new slide can be expected every 1 to 2 years as long as Sherman Peak maintains its thermal activity. The last slide occurred in August 1973.

The report points out that none of the recent slides have extended beyond the end of Boulder Glacier, but warns that repeated avalanches could undercut Sherman Peak and eventually cause a large part of it to collapse. The resulting avalanche could be 100 times the volume of any that has happened so far and extend beyond the glacier into Boulder Creek Valley or even further, the report states.

Studies are now being undertaken by the U.S. Geological Survey and by the University of Washington to determine the magnitude of recent thermal activity and the possibility of major slides.

^{1/}David Frank, Austin Post, Jules D. Friedman, "Recurrent Geothermally Induced Debris Avalanches on Boulder Glacier, Mount Baker, Washington," Journal of Research, U.S. Geological Survey, Vol. 3, No. 1, January-February 1975, pp. 77-87.

3.0 Relationship of the Proposed Action to Land-Use Plans

3.1 Area Land-Use Plans. The proposal is consistent with the objectives of local land-use plans for Skagit County adopted in the Comprehensive Land-Use Planning Alternatives for the Skagit River Flood Plain and Related Uplands, prepared by the Skagit Regional Planning Council, April 1973.

In the above Comprehensive Plan, the regional council recommended that future development of the Skagit River flood plain be guided toward the following:

- (1) Existing urban areas should be protected from 50-year frequency floods.
- (2) Development of unprotected flood-plain areas should be curtailed.
- (3) Existing and future agricultural use of the flood plain should be provided with at least 20-year flood frequency protection.
- (4) New developments should be directed to the floodsafe and upland areas of the Skagit Region.
- (5) The rural lifestyle of the area and its attendant recreational opportunities should be preserved.

To implement these recommendations, the regional council has suggested that flood-plain areas upstream of the town of Lyman be devoted to agriculture, open space and forest uses. Residential and commercial developments outside of existing urban areas would be limited. Downstream of Lyman, the flood plain would be devoted to agriculture, but mixed with forest uses in areas not suitable for development. Urban uses would be confined to existing towns with some fringe lands reserved for future development as population levels increase.

The proposed action of alternative 3, shown on page 49 of this document, is in general agreement with the regional council's recommendations and land-use plans. As the flood protection provided by this alternative is not sufficient to allow relaxation of flood-related land-use controls, development in flood hazard areas as a result of the additional flood protection are expected to be minimal. However, some development pressure may occur on specific sites within the flood plain, particularly on those lands close to existing urban areas and protected by existing levees and dikes. In such case, it is expected that other regulatory measures available to the county would be employed to limit unwanted development. Specifically, flood-plain management techniques and flood-plain zoning measures included in alternative 3 implementation are seen as the best devices for development control.

3.2 Other Plans. In addition to the plan mentioned above, there are several other county-, state-, and Federally-sponsored studies underway to determine the future potential of lands along the Skagit River System. Two of the more important efforts are studies by Skagit County under the Washington State Shoreline Management Act of 1971, and recently completed studies by the U.S. Forest Service classifying portions of the Skagit River and selected tributaries under the Wild and Scenic Rivers Act (Public Law 90-542).

3.2.1 Skagit County Shoreline Master Plan. Skagit County is in the process of developing a master plan for land use for county shoreline areas of statewide significance. When completed, this plan will classify and regulate land use within 200 feet of the Skagit River and its tributaries. The county has enacted an interim zoning ordinance until completion of their studies which enforces a 25-foot setback for construction along the Skagit River and its tributaries, and prohibits construction within the 15 year flood plain in the Skagit Basin.

The additional flood protection offered by the Baker Project proposal is entirely consistent with the intent of the Shoreline Management Act and is compatible with present zoning and building regulations.

3.2.2 Wild and Scenic Rivers Study. The U.S. Forest Service has proposed that portions of the Skagit River and selected tributaries be classified under the Wild and Scenic Rivers Act (Public Law 90-542). The Forest Service proposal recommends that the mainstream Skagit River be classified as a "Recreation" river starting from the upstream side of the pipeline crossing at Sedro Woolley upstream to Bacon Creek (about 25 miles upstream of Concrete for a total of 58.5 miles); and that the Cascade River (20.8 miles), Sauk River (50.8 miles); and Suiattle River (27.4 miles) for their entire length, be included as "Scenic" river components. Rivers recommended for inclusion into the Wild and Scenic Rivers Act total 157.5 miles in length.

The Wild and Scenic Rivers Act defines the classification of Recreation River and Scenic River as follows:

Recreation - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Scenic - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Along classified rivers the construction of dams, levees, and other water resource projects which would adversely affect the free-flowing character of the rivers, esthetics, water quality and other similar considerations would be prohibited. Road and utility crossings would generally be restricted to existing corridors.

The Forest Service deleted from its proposal nearly 9 miles of river below Sedro Woolley which would qualify for inclusion in the act. This was done to accommodate the development of future flood control structures, specifically a 60,000 c.f.s. emergency flood-water bypass from the Skagit River into Padilla Bay (The Avon Bypass Project). This project is now under study by the Corps of Engineers at the request of Congress but has not been authorized. (Further discussion of this project is found in sections 4 and 6 of this EIS.)

The proposed action of additional flood control storage at Baker project is compatible with the Wild and Scenic Rivers proposal of the Forest Service. The Baker project was specifically developed to accommodate Wild and Scenic Rivers status for the Skagit and its tributaries, while still achieving an acceptable level of flood damage reduction in the Skagit Valley. The Baker project would not pose any serious adverse effects to existing recreational, fish and wildlife, or environmental values inherent in the classification of the Skagit River to Wild and Scenic River status.

Beneficial impacts of the Baker project in conjunction with Wild and Scenic River classification include: Encouragement of flood-plain management techniques as called for in the proposed alternative to reduce the potential increase in monetary damage caused by floods; allows Wild and Scenic classification by providing a nonstructural alternative for increased flood protection; does not preclude the implementation of future flood control projects downstream of Sedro Woolley to increase flood protection even further.

4.0 Environmental Impact of the Proposed Action

4.1 Introduction. The proposed flood control storage project at Baker Lake will require no construction and only a change in project operation. The effects of the proposed action are anticipated to be minor in most respects. In the discussion of impacts which follow an attempt was made to isolate as many potential effects as possible, even if they seemed to have only low probabilities of occurring.

4.2 Impacts on the Human Environment

4.2.1 Population and Community Growth. The proposed action is not expected to have significant effects on population or community growth within the flood plain. New job opportunities would not be created as a direct result of the project, thereby limiting project effects on future population immigration. The population projections presented in Section 2 should be applicable regardless of the implementation of the project.

Although increased flood control capability has the potential of creating increased development pressure on flood-plain lands, especially those close to urban areas and those now protected by dikes and levees, this pressure is expected to be minimal. To the extent that any new lands are brought into intensive development because of added flood protection, a potential for greater personal and economic losses would exist when future major floods do occur. However, the application of stringent flood-plain management techniques and flood-plain zoning by Skagit County, as called for in the recommended plan, should reduce the likelihood and severity of such losses.

4.2.2 Community Services and Facilities. The cost of flood-related community services and facilities should decrease with implementation of the proposal. A portion of local and state funds which would otherwise be appropriated for flood fighting, rescue, and repair may become available for the improvement of other community services and facilities.

4.2.3 Housing. With a decrease in the severity of flooding, homes would incur less damage, thereby allowing the homeowner to invest more in home improvements. As a result, the general quality of housing in the areas affected may increase.

4.2.4 Displaced Persons. Because the proposal would not require construction or acquisition of lands, no displacement of citizens would be required for implementation. The probability of persons being displaced by flooding will be decreased.

4.2.5 Recreation. The proposed action should have only minimal effects on recreational use of the Baker Lake area. Fishing and other recreational uses of the reservoir area such as camping and

picnicking generally conclude shortly after Labor Day of each year. As the increased drawdown will not begin until 1 November, impacts on lakeshore use for recreational purposes will be limited.

4.2.6 Health and Safety. By decreasing the severity of flooding in the lower Skagit Basin, associated public health problems should decrease. The project is aimed at minimizing the occurrence of severe floods which constitute a public health threat.

4.2.7 Employment and Income. Because the proposed action would not require construction, local employment or income levels would not be impacted to an assessable degree. Temporary disruption of employment due to flood repair will decrease slightly.

4.2.8 Property Values and Tax Revenues. The proposed action may have a slight impact on residential and agricultural property values. Permanent residences and farms damaged by past floods or structures now located in the flood plain may increase in value somewhat.

The impacts of flood protection on commercial and industrial property values are expected to be minimal. Property tax revenue may rise to the extent that assessed valuation of all affected property increases.

4.2.9 Local Government Finance. There would be no non-Federal costs associated with this proposed plan. Benefits accruing to local governments will occur as a result of decreases in damage to public facilities.

4.2.10 Business and Commercial Activity. A relatively small portion of land within the flood plain is used for industrial purposes. Because there will only be a minimal reduction in flooding frequency, industrial expansion in the flood plain as a result of the project is not expected to occur. The project would, however, provide protection to existing industry in the flood plain and thereby reduce potential future flood damages. The average annual commercial benefits over the 100-year study period as a result of the project are estimated to be about \$320,000. As was the case with other economic sectors of the community, commercial development of the flood plain is not expected to increase as a result of the project.

4.2.11 Agricultural. The agricultural sector of the economy would realize economic benefits as a result of the proposed action. Average annual monetary benefits accruing to farmers over the 100-year study period are estimated at \$390,000. This may induce a minor increase in agricultural development of the study area as lands could be put to more intensive agricultural uses.

4.2.12 Intangible Effects. Intangible effects of the project include reduced probability of accidental death or injury due to flooding; increased economic security of those now living within the flood

plain; reduction in costs of providing emergency flood equipment; and increased security in planting, growing, and harvesting of agricultural commodities.

4.3 Impacts on the Natural Environment.

4.3.1 Water Quality. Water quality of the Skagit and Baker Rivers is generally regarded as excellent. The Washington State Department of Ecology has classified the Baker River as AA, extraordinary. The Skagit River is classified as A, excellent, from its mouth to river mile 17 (Mount Vernon), and AA, extraordinary, from river mile 17 to the Canadian border.

Previous investigations found that bacteriological concentrations varied over the length of the Skagit River, showing a trend of decreasing quality downstream from Marblemount. Coliform counts measured in numbers of organisms per 100 milliliters of water ranged from a low of 0 to a high of 230 at Marblemount, and from a low of 0 to a high of 24,000 at Mount Vernon. Waters with coliform concentrations of 1,000 per milliliter or greater are considered as unsafe for domestic water supply and contact recreation.

Releases from Baker Lake are expected to increase an average of about 1,900 c.f.s. over existing conditions during the period of additional 1 drawdown between 1 and 15 November of each year. These higher flows would not change the quality of water in the Skagit system now regarded as excellent or extraordinary, and may improve the water quality of the lower reaches of the Skagit through increased flushing and by maintaining the content of dissolved oxygen in river waters.

The possibility of increased levels of nitrogen supersaturation in waters released from the Upper Baker project due to spilling at the damsite was considered with water quality data collected in 1973 for Puget Power and evaluated in light of proposed operation changes. No appreciable increase in nitrogen is expected as the drawdown would generally be accomplished by passing the estimated 1,900 c.f.s. through the powerhouse rather than over the spillway.

4.3.2 Velocities. Velocities in the Baker River and the main stem of the Skagit River would increase during the first stage drawdown period of 1 October to 15 November. The Skagit River and its tributaries usually have lowflows from August through September after the snowpack has melted and ground-water flow has been depleted. Heavy rain accompanied by warm, moist winds, commonly occurs from October through February. These conditions, although coinciding with increased drawdowns, are not expected to significantly increase total flows and velocities in the Skagit River system and do not represent dangers to existing levees, increased downstream riverbank erosion, or to existing man-made structures close to river shores. Total

flows in the Skagit at Concrete are expected to increase by about 1,900 c.f.s. due to Baker Lake drawdown, representing about a 12 percent increase over average flows during October.

4.3.3 Water Temperature. The effect of Baker Lake drawdown on water temperatures in the Skagit River at Concrete were calculated not to exceed a 3° F. increase. Temperatures in downstream reaches were not predicted. The results of these calculations are summarized below:

Temperatures of water discharged from the Upper Baker and Lower Baker Dams average about 54.5° F. during October. Water temperatures in the upper reaches of the Skagit River near Concrete average about 48.2° F. during this same period. Assuming a complete mix of water at or near the convergence of these two waterways at Concrete, the additional 1,900 c.f.s. flow from the Baker at an average temperature of 54.5° F. would not increase Skagit River temperatures beyond 51° F. This temperature is well within the recommended 60° F. maximum upper limit for salmon fishery habitat, and does not represent a significant problem in terms of water-holding capacity for oxygen or other dissolved gases. Because of the minor increase in temperature, no effects are foreseen on rate of fish egg incubation.

4.3.4 Flora. Existing vegetation adjacent to the reservoir pool is not expected to be affected by drawdown operations. However, the potential for abrasion of reservoir shoreline may decrease due to the proposed drawdown, and vegetative cover in some areas may then re-establish itself.

4.3.5 Fisheries Resources. Present reservoir drawdown at the Upper Baker Dam results in some sockeye salmon redd losses at higher elevations. Because Baker Lake is nearly full during the start of the spawning season in early fall, some sockeye salmon spawn in lakeshore gravels at elevations above 700 feet and as high as 720 feet. Lakeshore spawning occurs when the artificial spawning beaches are filled to capacity, which happens about once in 2 to 4 years. When lakeshore spawning begins before drawdown, some eggs at higher elevations are left exposed and consequently die. By drafting Baker Lake from elevation 720.6 to elevation 707.8, a rate of about 0.8 feet per day during 1 to 15 November, fish that otherwise might have spawned at the higher elevations would be discouraged from doing so. Because the proposed plan would also result in earlier drawdowns than has been the case in the past, there exists the potential for further reduction in redd losses now experienced during sockeye salmon spawning season. Follow up studies will be made to verify this. As lake elevations dropped, fish would seek out and spawn in other lake areas and natural spawning streams.

The U.S. Fish and Wildlife Service, with concurrences from the Washington Department of Fisheries, the Washington Department of

Game and the National Marine Fisheries Service, has recommended that the proposed plan include within it an alternative drawdown plan to be implemented in years of heavy fish returns to Baker Lake. During years when the volume of sockeye salmon returning to spawn exceeds the capacity of the artificial spawning beaches and must be released to spawn in natural lakeshore areas, it was recommended that drawdown begin immediately after Labor Day and be completed by October 1. This modification would insure that low water levels are reached before the majority of beach spawning has taken place, thereby eliminating losses of sockeye redds which now occur periodically with existing drawdown schedules.

While the proposed plan would not meet fisheries agencies' desires in years of heavy fish returns, it should result in improvements over existing conditions. Although there would be some spawning losses regardless of drawdown schedule, the proposed plan is not expected to result in greater losses, and may reduce the amount of redd losses now experienced. Future studies would be conducted to determine the extent of impacts to Baker Lake spawners if the proposed plan is authorized. These studies would be partially funded by the Corps of Engineers in conjunction with the Washington Department of Fisheries, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

Keeping Baker Lake below 707.8 feet through the spawning season, except during actual flood control operation, would not inhibit fish access to major spawning streams. Past observations have shown that stream access is not a serious problem until the pool reaches elevation 688 feet.

4.3.6 Fauna. As reservoir levels would not be increased beyond those currently in use, and since no further construction will be needed to implement the proposed drawdown, impacts to wildlife resources are expected to be negligible.

4.3.7 Erosion. Baker Lake will be subject to slightly increased levels of shore erosion due to the exposure of additional land area during the reservoir drawdown period of 1 October to 1 March of each year. The drawdown schedule coincides with the wet season beginning in October and November and lasting from 6 to 7 months. Typically, about 80 percent of the yearly total precipitation falls during this period with November, December, and January the months of greatest precipitation. The soil formations adjacent to Baker Lake are classified as sandy and gravelly loams with parent material consisting of gravelly, stony, and sandy loams on bedrock or glacial ablation or basal till. Soil pH is slightly acidic and soil resistance to erosion is classified as low to moderate. While the climatic and geologic conditions of the area will contribute to additional deposition of silt and debris downstream, and produce a measure of additional scouring of the exposed lakeshore the overall impacts of these changes in relation to water quality, fish habitat, and marine vegetation is expected to be minimal.

4.3.8 Visual Landscape. Earlier reservoir drafting would expose about 13 additional feet of lake bottom consisting of rotting tree stumps, rock outcroppings, and mud flats. The recreational experience of those using the reservoir at these times would be diminished. However, this impact is expected to be minor due to the normally low recreational use of the area during months when reservoir drafting is scheduled to occur.

4.3.9 Mt. Baker Volcanics. Although the possibilities are very remote, recent steam venting on Sherman Peak could spark a mud-flow down Boulder Glacier to the east and into Baker Lake. There is evidence that at least two and possibly more slides similar to this have occurred in the past few hundred years. Depending upon the size and extent of such an occurrence, the proposed action could result in a benefit. By holding the reservoir at lower levels for a longer period of time, a measure of mitigation would be provided. However, if such a slide were extensive enough, it could cause a wave to overtop the dam at any pool level and cause downstream damage.

4.4 Impacts Resulting from Project Operation.

4.4.1 Flow Regimen. The proposed plan would change the flow regimen of the Skagit River below Concrete when the Baker Lake water level is drafted an additional 12.8 feet between 1 to 15 November. At present, Baker Lake is drawn from elevation 724 feet to elevation 720.6 feet during October. However, the lake has been lowered to below elevation 700 feet in most years to satisfy power requirements. The proposed action would require storage evacuation to a maximum of 707.8 feet for flood control during the first part of November to provide 58,000 acre-feet of additional storage for a total of 74,000 acre-feet. The storage space would be used when the unregulated discharge of the Skagit River near Concrete is forecast to exceed 90,000 c.f.s. At that time, discharge from Upper Baker Project would be reduced to minimum required for power generation, 5,000 c.f.s. When the Skagit River reaches its maximum discharge near Concrete and begins receding, storage at Upper Baker Project would cease and Baker Lake would be drafted to elevation 707.8 feet at a rate which would not reverse the Skagit River recession.

4.4.2 Power Losses. The power-generating capacity of the Upper Baker Dam would be reduced by changes in operation necessary to provide increased flood control. Power losses would consist of energy losses and capacity losses. Energy loss would result when water which ordinarily would be passed through the power units is routed over the spillway to make storage space available for flood control. Capacity loss would be realized because flood regulation would require reservoir drawdown which reduces hydraulic head available for power generation.

Average energy loss as a result of provision of additional flood control storage over the 5 month period has been estimated to be 2.681 megawatts or 1.117 megawatts annually. Typically, 400 to 500 all electric homes could be serviced by this amount of power if it were available in the future.

Capacity power loss during the period of required drawdown has been estimated to range between 6.3 and 0.2 megawatts depending upon whether or not the project is dedicated to supplying maximum power during periods of peak demand. The loss of 6.3 megawatts would represent a reduction of about 0.8 percent of the total peaking capacity of existing Skagit River hydropower plant or about a 0.5 percent reduction in required peak for a city about the size of Seattle. Puget Power has indicated that in absence of the proposed plan Upper Baker project would in the future be operated more as a peaking plant. During the normal flood control period under existing conditions, the pool would be kept as near elevation 720.6 as possible during the flood season in order to maximize peaking capability.

Puget Power would be reimbursed for power losses resulting from the provision of additional flood control storage space through replacement power in kind from the Bonneville Power Administration (BPA). Net power losses in terms of revenue foregone by the Federal Government in providing replacement power would be approximately \$56,000 annually, based on rate schedules in effect in May 1975. However, BPA itself would be fully compensated in that annual revenues foregone would be considered a nonreimbursable Federal flood control cost, to be deducted each year from the reimbursable power operation and maintenance account of the Chief Joseph Dam, Washington, project.

The methodology used by Puget Sound Power and Light Company in determining power loss is cited as follows: 1/

"Studies performed to determine the power and energy losses of the Baker Project were made with a computer code entitled, "Baker River Hydro-Reg."

This computer program is a mathematical model of the Upper and Lower Baker Plants. The model consists of power generation module and a reservoir module for each plant. The power generation module develops power from the routed natural flow and any storage is dictated by the rule curves for each day. The generation module computes the hydraulic head from the reservoir elevation and the tail-water characteristics. The capacity and energy are selected from (P-Q-H) tables that correspond with the hydraulic head and plant discharge. Daily reservoir elevations are determined by proportion draft to meet specific rule curve elevation.

1/The methodology was provided in a letter from the P.S.P.L. dated May 3, 1974. The full text of the letter and supporting figures can be found in appendix 2 of the draft authorization report, Baker Project.

The parameter which defines the study conditions are the historical natural flows, the design of the reservoir rule curve and the physical characteristics of the plants.

The output is printed on magnetic tape and hard copy. The hard copy shows all physical characteristics for each plant for each day. This includes:

1. Month
2. Day
3. Year
4. Natural flow at site (QN)
5. Draft from upstream storage (QUS)
6. Draft from at site storage (QS)
7. Total plant discharge (QD)
8. Spill (Spill)
9. Accumulated Draft (MSFM & MSFD)
10. Reservoir elevation (ELEV)
11. Conversion Factor (H/K)
12. Power from natural flow (PN)
13. Power from storage (PS)
14. Average power (PA)
15. Capability (P)
16. Plant identification (PL-ID)
17. Accumulated draft at site (SEINIT)

The hard output for a five year study is a very large volume. A computer code entitled, "Summary" has been developed to summarize the results of these studies. Monthly results on an annual basis for each study are printed in hard copy form for ease of analysis."

Although the amount of power lost is small when compared to the total production in the Bonneville system, there would still be some net loss in the Northwest system production capability. These losses would occur during the winter season when peak energy demand is at its highest. Moreover, coming at a time when future power shortages are anticipated to occur, the proposed project operation change could contribute to future shortages in the Pacific Northwest. These net losses would contribute cumulatively to future power shortages which may justify construction of new generating facilities.

4.5 Impacts of Proposed Project in Relation to Other Anticipated Developments.

4.5.1 General. A number of Skagit River basin flood damage reduction alternatives have previously been considered during the Puget Sound and Adjacent Waters Comprehensive Study. Raising of the existing levees downstream from Burlington and improving the channel at several locations are elements of the comprehensive plan, adopted by the Pacific Northwest River Basins Commission, as well as Skagit

County's Comprehensive Flood Control Plan. A proposal to construct a bypass, termed the Avon Bypass project also is an element of these plans.

Skagit County has recently indicated they will oppose classification by Congress of the Sauk River as part of the National Wild and Scenic River system. National classification would preclude a future storage project on the river and prevent the county from exercising an option for additional flood protection. The county commissioners, reflecting the views of the basin residents, are desirous that flood control on the magnitude of 50-year protection be provided. This level of protection could only be achieved through a combination of measures, including additional storage at the Upper Baker project, and construction of the levee and channel improvement and the Avon Bypass or a dam on the Sauk River.

4.5.2 Levee and Channel Improvements. The Flood Control Act of 1966 authorized construction of a levee and channel improvement project along the Skagit River from just upstream of Mount Vernon downstream along both its north and south forks. Also authorized by the 1966 act was Federal involvement in the inclusion of recreation facilities as part of the Avon Bypass project. The levee and channel improvement project would provide a uniform minimum safe channel capacity of 120,000 c.f.s. from just upstream of Burlington downstream through the delta. This capacity would allow safe passage of floods (under existing conditions of upstream storage) having an average recurrence interval of up to 8 years. In combination with the Avon Bypass, the levee and channel improvement project would provide protection against floods having an average recurrence interval of up to 35 years. The latter project has been held up pending additional storage development or construction of the Avon Bypass.

4.5.3 Avon Bypass. No Federal flood control works have been constructed in the Skagit River basin. The Flood Control Act of 1936 authorized the Avon Bypass, a project for the partial control of floods in the lower Skagit Valley. The bypass channel, as proposed, would divert excess Skagit River flow from the main river channel near Burlington to Padilla Bay. The project has not been undertaken, as Skagit County has been unable to meet the requirements of local participation. Substantial costs would be involved in the relocation of transportation facilities and the acquisition of right-of-way. Also, the project would pass through an area used for agricultural purposes, resulting in significant disruptions. The most recent studies, conducted in 1966, indicate the Avon Bypass should have a capacity of 60,000 c.f.s., although it would be possible to construct the facility to handle larger flows.

4.5.4 Possible Development Sequence. In 1970, Skagit County adopted a comprehensive flood control plan when they formed a countywide flood control district in accordance with the laws of the State of Washington.

The flood control district enables the county to assume the responsibility of sponsorship of various flood control improvement projects. The levee and channel improvement project authorized by the Flood Control Act of 1966 is viewed as phase one of the county's comprehensive flood control plan. Phase two of the plan provides for obtaining flood control storage from the existing Upper Baker River project. Phase three would be additional flood control storage on the Sauk River and/or construction of the Avon Bypass. The county has consistently, at public meetings and in correspondence to Senator Warren G. Magnuson in June 1974, reaffirmed its desire for flood control improvements, particularly additional storage at the Upper Baker Project. Skagit County has asked that the previously authorized Skagit River levee and channel improvement project be undertaken as soon as possible. The provision of additional flood control storage at Baker Lake is expected to allow this project to proceed.

5.0 Unavoidable Adverse Environmental Impacts.

5.1 Earlier reservoir drafting of about 12.8 feet would further expose the shoreline during November. However, as Baker Lake is normally drafted for hydroelectric generation below elevation 707.8 by early January, the net change in shoreline exposure would not be significant, although the increased length of time shoreline areas are exposed to the erosive forces of wind and weather could result in additional lake siltation and turbidity.

5.2 The additional flood control storage may create a false sense of security among those now living within the flood plain. To the extent that this additional security results in increased activity in flood plain development, greater potential would exist for personal and economic losses associated with future floods.

5.3 Needed hydroelectric power would be lost due to the reduced hydraulic head between lake elevations of 720.6 feet and 707.8 feet. These losses would occur during the winter season when peak energy demand is at its highest. The proposed project would cumulative add to future potential energy shortages in the Pacific Northwest, although not greatly, but may have to be made up through other means such as construction of new generating facilities.

6.0 Alternatives to the Proposed Action.

6.1 Introduction. This section presents the alternatives that were considered during the planning process, as well as variations of the plan finally recommended. The alternative selected for action is number 3, found on page 49. The format used here to present the major alternatives considered is the same as was used in the public brochures distributed during the study for public comment. In addition, the rationale used for rejection of alternatives is included.

6.1.1 ALTERNATIVE 1

DO NOTHING

DESCRIPTION: No additional structural measures would be constructed to reduce flood damages. Existing levees would be maintained and Ross and Upper Baker storage projects continued to be operated for flood control as they have been in the past. Flood plain management would be limited to control exercised through county and incorporated community land-use zoning.

EFFECTS:

Fish and Wildlife: Further loss of wildlife habitat expected with development of flood plain lands.

Recreation: Increased recreation homesite developments expected in flood hazard areas.

Land Use: More intensive development expected than would be the case with flood-plain regulations.

People: Present population growth trends would continue.

Flood Damage: The approximately 100,000 acres of Skagit River flood plain downstream of the mouth of Baker River, near Concrete, would continue to be subject to the current level of flood risk with future damages expected to increase over that expected with an adequate flood plain management program.

REASON ELIMINATED: This alternative would not be responsive to expressed desires of the public and Skagit County for action leading to reduction of existing flood problems. As Skagit County and State of Washington are moving forward with strengthened flood plain management programs implementation of this alternative would be a step backward from pursuing Federal and state goals and policies which call for reduction of flood damages and flood risk. The majority or agencies, groups, and individuals responding to this alternative indicated their opposition to it.

6.1.2 ALTERNATIVE 2

FLOOD PLAIN MANAGEMENT ALONE

DESCRIPTION: No additional flood control structures would be constructed. Existing levees would be maintained and Ross and Upper Baker storage projects continued to be operated as they have in the past. In addition, the following specific nonstructural measures would be relied upon to lessen the growth in flood damage potential:

a. The existing warning system would continue to provide residents of the Skagit basin advance notice of impending floods in sufficient time to permit them to evacuate some personal property. Flood forecasts are issued by the U.S. Weather Bureau and broadcast by radio and television stations with Skagit County Civil Defense Office responsible for alerting people to the danger of impending floods.

b. Flood proofing would be applied to all future development in the flood plain. In most cases, this would involve placement of fill and constructing the ground floor of structures above the 100-year flood level. The majority of existing developments in flood hazard areas are not expected to be flood proofed due to the expense involved and the availability of relatively inexpensive subsidized flood insurance.

c. New construction would be severely restricted if not precluded in designated floodway areas.

d. The flood insurance program, established under the Housing and Urban Development Act of 1968, as amended in 1973, would be used to make available Federally subsidized flood insurance. Skagit County is presently qualified for this insurance, which applies to one-to-four family dwellings, properties occupied principally by small business, and to the contents of properties of these types. Cropland, industry, and large businesses are not eligible for flood insurance. Other losses, such as interruptions to transportation, also are not covered.

ANNUAL COSTS:

Federal - USCE and HUD	\$248,000 (flood information & insurance)
State of Washington	8,000 (flood plain zoning & permits)
Skagit County	20,000 (flood plain zoning & permits)
Individuals	<u>65,000</u> (flood proofing & insurance)
Total	\$341,000

EFFECTS:

Fish and Wildlife: Existing trends would continue.

Water Quality: Existing trends would continue.

Recreation: Existing trends would continue.

Land Use: Conversion of agricultural and open space lands to intensive uses would be less than under alternative 1.

Flood Damage Prevention: Flooding would continue; however, damages to future developments in flood prone areas would be lessened due to flood proofing, advanced flood warning, and restrictions designed to keep development out of extreme flood hazard areas.

Transportation: Road, highway and rail traffic would still be subject to disruption during floods.

ECONOMIC ANALYSIS:

Average annual benefits	\$1,058,000 (flood damage reduction & flood insurance pay- outs)
Average annual costs	341,000
Benefit-cost ratio	3.1

REASON ELIMINATED: Would not be responsive by itself to expressed desires of Skagit County for measures which would reduce the current flood threat. Structural solutions are required in order to increase flood protection for existing developments. Alternative 2's main effectiveness would be in controlling future developments. Through public brochure drafts and at a meeting held in Burlington in April 1973, public appeared to favor combining this alternative with additional flood control storage at the Upper Baker project (alternative 3).

6.1.3 ALTERNATIVE 3

FLOOD PLAIN MANAGEMENT WITH ADDITIONAL FLOOD CONTROL STORAGE AT THE UPPER BAKER PROJECT

DESCRIPTION: Flood plain management measures defined under alternative 2 are included in this proposal, which calls for a change in operation of the existing Upper Baker hydroelectric project, owned and operated by Puget Sound Power and Light Company. The Upper Baker project currently provides 16,000 acre-feet of flood control storage, as compensation for natural valley storage lost due to construction of the project. The Federal Power Commission project license allows up to an additional 84,000 acre-feet of flood control storage to be utilized at the project, provided that Puget Power is satisfactorily compensated for the attendant reduction in power production capability. The following alternative volumes of increased storage were examined:

Storage Space (acre-feet)		Minimum Flood Control Pool Elevation
<u>Additional</u>	<u>Total</u>	
84,000	100,000	701.4
58,000	74,000	707.8
50,000	66,000	709.8
40,000	56,000	712.1

The recommended plan calls for an additional 58,000 acre-feet of storage space to be provided by 15 November. The pool would be kept below elevation 707.8 from 15 November, except during an actual flood event, until 1 March. Full use could be made of the reservoir's capacity for hydroelectric power generation by 1 April.

IMPLEMENTATION COSTS:

Federal - \$21,000 - Preparation of reservoir regulation manual and negotiation of power loss evaluation agreement.

AVERAGE ANNUAL COSTS:

Actual

Federal - \$68,000 - Federal power revenues foregone in providing replacement power from the Federal system to Puget Power and allowance for administrative costs associated with Upper Baker project flood control operation, including follow-up monitoring of environmental impacts during first 5 years of changed operation.

Economic

Federal - \$434,000 - Alternative cost of replacement power and average annual administrative costs associated with additional flood control at Upper Baker project.

AVERAGE ANNUAL BENEFITS:

Flood damage reduction - \$1,127,000

BENEFIT-COST RATIO: 2.6 (economic)

UPPER BAKER FLOOD CONTROL WITH
FLOOD PLAIN MANAGEMENT

AVERAGE ANNUAL COSTS: \$775,000

AVERAGE ANNUAL BENEFITS: \$2,185,000

BENEFIT-COST RATIO: 2.8 (economic)

EFFECTS:

Fish and Wildlife: Reservoir fishery would not be adversely affected. Additional water, released from the Upper Baker project, during flood control drawdown, would augment Skagit River flows during salmon spawning.

Water Quality: Lower reservoir levels during the period of heavy winter rains could increase siltation in Baker Lake and result in higher turbidity downstream.

Recreation: Downstream Skagit River sport fishery could be improved by low-flow augmentation.

Land Use: The increased flood protection provided by this alternative would not be sufficient to allow relaxation of current restrictions on intensive developments in flood hazard areas. Therefore no effect on land use is expected.

Flood Damage Prevention: Additional flood protection would be provided for nearly 100,000 acres of Skagit River flood plain located below the mouth of Baker River, near Concrete.

Power Lost: Hydroelectric power generation capability at the Upper Baker project would be reduced due to the requirement for

a lower pool during the winter flood season. This could contribute to power shortages in the Pacific Northwest. However, the relatively small amount of power involved is not expected to significantly impact the overall system. Puget Power would receive replacement power in kind from the Bonneville Power Administration (BPA). Net power losses, in terms of revenue foregone by the Federal Government, in providing replacement power would be approximately \$56,000 annually, based on rate schedules in effect in May 1975. However, BPA would be fully compensated in that annual revenues foregone would be considered a nonreimbursable Federal flood control cost, to be deducted each year from the reimbursable power operation and maintenance account of the Chief Joseph Dam, Rufus Woods Lake, Washington, project.

OTHER EFFECTS: Other impacts on authorized Corps of Engineers flood control projects are as follows:

a. Levee and Channel Improvements: The project authorized by the 1966 Flood Control Act for improving the Skagit River channel and raising and strengthening about 34 miles of levees downstream of Burlington would be augmented by this alternative. Although now in a deferred status, if the levee and channel improvements are constructed in the future, the combination would increase the minimum level of protection from 3 years to an average recurrence interval of 11 years. However, if implemented, flood protection would increase in the area from Burlington downstream.

b. Avon Bypass: This project was authorized by the Flood Control Act of 1936 and modified in 1966. It consists of a diversion channel 8 miles long from near Burlington to Padilla Bay; a 4-mile levee; drainage structures; and widening of the Skagit River channel for 2 miles. The project is currently in a deferred status, but if constructed in the future, subsequent to Alternative 3 and the levee project, would increase minimum flood protection from 11 to 59 years, for the area from Burlington downstream.

6.2 Other Proposals Considered.

6.2.1 Reservoir drawdown to provide 58,000 acre-feet additional flood control storage (Alternative 3), but with drawdown to start directly after Labor Day of each year. The direct benefits of this proposal would accrue to anadromous fish which spawn in Baker Lake.

Reservoir drawdown under this proposal would begin 1 day after Labor Day of each year, and would be completed no later than 1 October. This action would provide fisheries benefits by decreasing the magnitude of sockeye salmon egg losses now experienced under present Upper Baker Dam operating schedules because of redd dewatering. Flood control benefits would remain the same as in Alternative 3.

This proposal is not presently being considered due to the constraints placed on the scope of possible alternatives by the Federal Power Commission license authorizing the Upper Baker project. As this license limits reservoir drafting modifications to flood control only, reservoir regulation in the interest of possible fisheries enhancement benefits would require a change in the terms and conditions of the license. A request for such change is outside the scope of the present study. Also, early drawdowns may be detrimental to resident sport fishery and recreation use of the reservoir. This alternative would necessitate drawdowns during the late summer recreation season when the area is still in moderate use by the public. Additionally, the fishery enhancement benefits that might be derived from earlier drawdowns would have to exceed the economic value of greater power losses resulting from earlier drawdown in order to be justified.

7.0 The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity.

7.1 The proposed plan for Upper Baker flood control would increase protection of existing developments if the Skagit River floods but is not expected to have generally unfavorable short-term environmental impacts. The existing values of the area (recreation, wildlife, agriculture, urban life) would not be compromised with implementation of the project. Although there is a possibility that pressure for unwanted development of protected flood-plain lands would occur, it is likely that these pressures would be minimal because of the limited protection afforded by the project. Beyond this, any additional development pressures can be controlled through adequate planning of flood-plain lands and the institution of flood-plain zoning techniques.

7.2 The effects of the project on long-term productivity and maintenance of the environment are similarly judged to be beneficial. The project would continue to assist in maintaining the present level of economic and agricultural development of the region. Important other uses (fishery resources, for instance) of the area would not be irretrievably or irreversibly damaged over the long term.

8.0 Irreversible and Irretrievable Commitments of Resources Which
Would Be Involved Should the Proposed Action Be Implemented.

8.1 Until such time as the public interest demands otherwise, the operation of Upper Baker Project would be irreversibly committed to the provision of storage space for flood control purposes during winter months. This use would constrain use of the entire range of the reservoir during the winter months, thus restricting power generation operations.

8.2 Future commitments of resources for alternate means of power generation such as coal, gas, oil, or nuclear materials may be needed to make up for the net power lost due to this project.

8.3 Annual Federal power revenues in the amount of \$56,000 would be foregone with an irretrievable commitment to provide replacement power from the Federal system. As a consequence, opportunities could be foregone for other areas of public investment unrelated to flood control which might prove to have greater benefits to the quality of life.

9.0 Coordination With Others.

9.1 Public Workshops. A public workshop was held on 25 April 1973 in Burlington, Washington to determine the desires of interested citizens and a public meeting was held on 8 April 1975 in Mt. Vernon to present findings of the study. Forty-three persons attended the workshop, 17 gave testimony, and 3 letters were submitted, 2 before the meeting and 1 directly afterwards. There was general agreement among the participants on the need for flood control, however, there was disagreement on the means by which flood control could be attained. The 8 April 1975 meeting was attended by 45 persons.

9.2 Public Brochures. The Baker Lake flood control study got underway early in 1972, with a first draft public brochure mailed to interested parties in October 1972. This first brochure contained the original alternatives developed by Corps of Engineers and local interests. From November 1972 to February 1973, the public comments received on the alternatives were evaluated. At that time a tentative selection was made of the best alternative.

Draft #2 of the public brochure was prepared during March and April of 1973 listing all Pro and Con comments received from the public via the initial draft. This second draft brochure was then mailed to interested parties and the 25 April 1973 public workshop was announced.

A third draft brochure was prepared during May and distributed in June of 1973, again listing all Pro and Con statements received via draft brochure #2. This brochure draft was distribute to the public requesting additional views and comments. Fifty-two local, state, and Federal agencies, associations, and organizations participated in preparing the brochure through their responses. In addition, 17 unaffiliated persons participated. Prior to the 8 April 1975 public meeting, draft brochure #4 was prepared outlining the tentative recommendation for flood control and explaining the course of the study up to that time. (Please see appendix.)

9.3 Public Brochure Participants. The following is a list of those organizations and individuals who participated directly in the preparation of draft brochure's No. 2, 3, and 4.

ORGANIZATION

LOCAL

Skagit County
Engineer
Planning Department
Flood Control Council
Soil and Water Conservation District
Farm Bureau
PUD
Commissioners

LOCAL (Con.)

City of Burlington
Planning Commission
Public Works Director
City of Sedro Woolley
City of Mount Vernon
City of Lyman Planning Commission
Puget Sound Power and Light Company
Whatcom County
Town of Hamilton

STATE

✓ Dept. of Ecology
Land Planning Commission
Dept. of Fish
Dept. of Game
Dept. of Natural Resources
Planning and Community Affairs
Commerce and Economic Development
NW Air Pollution Authority
State Ecological Commission

FEDERAL

Soil Conservation Service
Mount Baker National Forest
Baker River Ranger Station
Bureau Sport Fisheries and Wildlife
Bureau Reclamation
Bonneville Power Administration
National Marine Fisheries Service
National Weather Service
Federal Power Commission
Environmental Protection Adm.

MISCELLANEOUS ORGANIZATIONS

Drainage Districts
District No. 21, Mount Vernon
District No. 14
District No. 13
Diking Districts
District No. 12, Sedro Woolley
District No. 12, Mount Vernon
District No. 21
District No. 2, Mount Vernon

MISCELLANEOUS ORGANIZATIONS (Con.)

Diking Districts (Con.)

District No. 17

District No. 15

District No. 20

Granges

Skagit Valley Grange #620,

Mount Vernon

Sierra Club

Wash. Environmental Council

Audubon Society

League of Women Voters

Pacific NW Water Assn.

INDIVIDUALS CONTRIBUTING TO BROCHURE

Robert K. Hammond

Margaret Yeoman

Bob Lundvall

Joe E. Kalt

Norman Hesseldahl

Stephen C. Mengler

Lou St. John

Paul Wilcox

9.4 Comments from Public. Letters commenting on the draft EIS are found below. The full text of letters received commenting on the environmental statement are found in section 9.5, following.

1. United States Department of The Interior, Bureau of Land Management.

Comment: There are numerous unsurveyed islands in the Skagit River below its confluence with the Baker River and several others in Skagit Bay at the river mouth which are under BLM administration. We do not believe, though, that the proposed project will have any adverse impacts on BLM programs or plans for these Natural Resource Lands.

Response: Comment acknowledged.

Comment: The Skagit River upstream from the town of Mt. Vernon has been declared by the Congress as a study river for possible inclusion in the National Wild and Scenic Rivers System (PL 90-542 of 10-2-1968).

Since the proposed project will withhold water from or release water to the Skagit River, depending on the flood control cycle, the effect of the project on the possible addition to the National Wild and Scenic Rivers System should be discussed. The statement should show positive evidence of correlating this project with the scenic rivers study being conducted by the Forest Service, the lead agency for the study.

Response: We have coordinated with the Forest Service throughout our respective planning periods. The Forest Service has just recently released their draft EIS concerning inclusion of the Skagit River system into the Wild and Scenic Rivers classification. The environmental effects of the Baker Lake Project on the Forest Service proposal is treated in Section 3 of this final EIS.

2. Advisory Council on Historic Preservation.

Comment: This is in response to your request of February 28, 1975 for comments on the draft environmental statement for the proposed Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comment to make at this time.

Response: Comment acknowledged.

3. United States Department of the Interior, Bureau of Mines.

Comment: The proposed modification in the operation of Upper Baker Dam and Reservoir for flood control purposes would not adversely affect mineral development in the Skagit River basin. Both documents adequately discuss the basin's mineral resources commensurate with the proposed action.

Response: Comment acknowledged.

Comment: The environmental statement should include any adverse or beneficial impacts as they relate to the proposed Skagit River Wild and Scenic River. The Forest Service provided information for the study (Authorization Report, page A-3), but a direct reference could not be found in the statement.

Response: The final EIS has been expanded to include the Forest Service proposal for inclusion of the Skagit River System into the Wild and Scenic Rivers classification. Documentation of the proposal and the effects of the Baker Lake Project on these plans are found in Section 3.

Comment: The statement does not mention the proposed Skagit Nuclear Power Project located just north of the river between Sedro Woolley and Lyman. Will the project have any adverse or beneficial effects upon the proposed power project?

Response: The Skagit Nuclear Power project is unrelated to the Baker project. Outside of both being located in the same general region and being power projects, there are no other similarities in the two projects.

Comment: Increased steam venting has occurred recently from Mt. Baker. Should this increase in venting activity continue or foreshadow a general increase in volcanic activity, the results could have a great impact upon the downstream Baker River system. Such impacts as avalanches and sudden release of waters from debris dams should be discussed in this environmental statement. One of the latest references to the increase in geothermal activity is "Recurrent Geothermally Induced Debris Avalanches on Boulder Glacier, Mt. Baker, Washington" by David Frank, Austin Post, and Jules D. F. Friedman, Journal of Research, U.S. Geological Survey, January-February 1975, Volume 3, No. 1, pp. 77-87. Further references are listed in this paper.

Response: Volcanic mud flows and debris flows down valley tributaries to the west bank of the present Baker Lake have occurred during the past several hundred years. We believe that holding the reservoir at lower levels for a longer period of time will provide a measure of mitigation should such an event occur while the reservoir is down, unless the debris flow is extremely large or close to the dam. We do not dismiss the possibility that a large debris flow could cause a wave to overtop the dam at any of the pool levels under consideration and cause downstream damage. Please see section 4.3.9.

4. United States Department of the Interior, Fish and Wildlife Service.

Comment: Page 8, Section 2.10, Fisheries and Wildlife Resources (draft statement). Steelhead fishing is mentioned as outstanding in Skagit River. Other important fish and wildlife values, including waterfowling on Skagit Flats, and saltwater salmon fishing should be included. Economic values for fish and wildlife resources should also be stated as those for agriculture.

Response: The final EIS has been revised under section 2.10 to more comprehensively cover the fish and wildlife values found in the study area. Tables 1, 2, and 3 have been included to display the value of catch for sport fisheries and game in 1973.

Comment: Page 10, Section 2.13, Land Use (draft statement). Land use with associated water requirements in Skagit County should include fish and wildlife.

Response: Fish and wildlife are documented under section 2.10. The land use discussion found in section 2.1.3 is intended only to give the reader a generalized picture of existing land use patterns in the Skagit River flood plain and related uplands.

5. Washington State Department of Game.

Comment: Consideration of timing of reservoir filling and how this will be affected by the proposed project is needed.

The report states additional flood control storage is to be available until 1 March, then filling "would begin and usually be complete by 1 April." (page ii, paragraph 1). Later the statement says filling "can" begin after March with "target date of 1 April" (page 2, paragraph 1). It goes on to say filling in "some" years "might" be later due to hydrologic conditions. This is very vague; clarification is needed in the final report.

Response: The above referenced statements have been revised as follows: "Storage capacity of 74,000 acre-feet would be reserved for flood control until the first of March, except when regulating for flood control. Puget Power could still draw the reservoir below 707.8 during this period for power production purposes. The required flood control storage capacity would be gradually reduced during March to permit Puget Power to refill to full pool, elevation 724, by 1 April." When a large snowpack exists, the reservoir may be held below full pool later than 1 April in order to capture the excess runoff for power generation.

Comment: (Reservoir) Filling too early (i.e., before emergence of Dolly Varden and kokanee fry) could adversely affect spawning success by slack-water inundation of spawning areas. If the reservoir is drawn down further than is the current practice, this could result in adverse impact on kokanee or Dolly Varden, depending on where they spawn.

Response: Conditions with the proposed operation change at Upper Baker Project during the refill period are not expected to differ appreciably from existing conditions. Therefore, the proposal should not adversely affect fisheries resources.

Comment: Late lake filling could adversely affect rainbow and cutthroat by encouraging spawning in stream areas that are later inundated. Since only small numbers of cutthroat and rainbow "natives" apparently exist in Baker Lake, this may be happening now. But data on spawning time and locations is needed to make a conclusive statement on this one way or the other. In summary, late lake filling could be advantageous for fall spawners (Dolly Varden and kokanee) but could be detrimental to spring spawners (rainbow and cutthroat trout).

Response: See previous comment.

Comment: Consideration of the relationship between project proposal and maximum drawdown for power generation is also needed. You stated, in part, "Alternative 3 proposes...holding the reservoir below elevation 707.8 feet...additional storage would be available...from

15 November to 1 March..." (page 2, paragraph 1). How far below elevation 707.8 feet would the reservoir be drafted as opposed to present conditions? We expect that drawdowns more severe or lengthy than presently experienced will adversely affect carrying capacity and productivity of the lake.

Response: Drafting of Baker Lake to elevations below our proposed 707.8 feet would be dependent upon the power generation requirements of Puget Power and on climatological conditions. The operation of the dam should not in the near future, however, result in any significant departures from past years as shown in figure 1 of this final EIS. In the long term Puget Power has indicated that they expect the drawdown to be less pronounced as the project will be operated more as a peaking project. As is mentioned on page 1, in normal years, Baker Lake is lowered to 700 feet elevation by mid-January for power generation purposes.

Comment: You may wish to mention the following information on Baker Lake's resident fishery in the Fisheries and Wildlife Resources section (pages 8-10). Kokanee, Dolly Varden, rainbow and cutthroat trout are all present in Baker Lake as self-sustaining populations (legal rainbows are reared and released for a put-and-take fishery, as you have stated). Kokanee are the most important species present; they sustain the largest naturally-produced harvest by far. Dolly Varden are harvested in smaller numbers but achieve "trophy size" and are specifically sought after by some anglers. Self-sustaining rainbow and cutthroat populations are small and contribute little to overall harvest.

The 1971 Baker Lake Creel Census (James Cummins, WDG, Dec. 1971) reported an estimated catch of 9,826 rainbow trout from a plant of 55,000 catchable size fish, 10,658 kokanee and 1,524 miscellaneous species - a total of 21,998 fish for the census period (1 July through 6 September, 1971). The survey showed the average angler fished 2.94 hours and caught 2.73 fish per trip (1.21 rainbow and 1.40 kokanee; average catch per trip). This yielded a total projected time of 25,538 man hours of fishing during the census period.

Many of the types of wildlife which may use Baker Lake and surrounding region are mentioned in this section. Swan should be added. You may also wish to mention that osprey nesting is reported on the east shore of Baker Lake. Baker Lake vicinity probably supports a fair number of ruffed grouse and a good population of racoon (Brown, Judith, Fish and Wildlife Resources of Mount Baker National Forest, Applied Research Bul. No. 2., Mar. 1974, WDG, pages 41, 42, 48).

Response: Section 2.10 has been expanded to include the above information relating to fishery and wildlife resources, while section 2.12 has been expanded to include the results of the Baker Lake Creel Census.

Comment: In addition to information on impacts on Baker Lake's resident fishery requested above, we suggest the final impact statement also include a discussion of project effect on turbidity conditions in Lower Baker and Skagit Rivers.

Response: As the draft EIS pointed out in Section 4.3.7, because of earlier drawdown during the "wet season" and because of the soil properties adjacent to Baker Lake, we expect additional scouring of the lakeshore and additional deposition of silt in Baker Lake. However, owing to the relatively minor increase in water outflow from Baker Lake during the drawdown period of 1-15 November, turbidity conditions in the Lower Baker Project (Lake Shannon) and Skagit Rivers are not expected to increase significantly.

Comment: Future studies to determine extent of impacts on Baker Lake spawners, if the proposed plan is implemented, are mentioned on page 53. We suggest the scope of the study be expanded to include resident game fish stocks which heretofore appear to have been overlooked.

Response: Future studies are intended to cover the impact of the Baker Lake proposal on Sockeye Salmon. However, if it is found that adverse impacts occur to resident fish, the nature and extent of these impacts will be studied as well.

Comment: Your assessment of effects on wildlife resources (page 53) addresses effects which may be sustained at Baker Lake. A decrease in open water space available to waterfowl will be experienced; you may wish to mention this also. Secondary impacts on wildlife should be acknowledged. The proposal seeks to provide additional flood protection to nearly 100,000 acres of floodplain and thus opens a potential (however small) for increased loss of wildlife resources existing in this floodplain area. The proposal will also help pave the way for stream and channel improvements and the Avon Bypass, projects which may result in adverse impacts on fish and wildlife.

Response: No net decrease in Baker Lake water surface area will result from the project. Any additional flood control project will have to be justified on their own merits. However, each additional project becomes more difficult to justify as only residual damages are used in benefit analysis.

Comment: We question the failure to acknowledge adverse impacts on fishery resources, covered in other areas of your report.

Response: No adverse effects on the fishery resources are expected. However the Corps of Engineers in conjunction with Federal and State Fish and Wildlife agencies will perform follow-up monitoring studies to verify expectations if the proposal is authorized.

6. The Skagit Regional Planning Agency.

Comment: The Skagit Regional Planning Agency had reviewed the Subject Draft Environmental Statement and concurs in general with the analysis and findings presented. We believe that the draft statement presents a fair statement of the facts as they exist at this time.

We further believe that the level of flood protection offered by a combination of the additional flood storage in Upper Baker, flood-plain management, and downstream levee and channel improvements is the minimum protection acceptable to the residents of the Skagit Valley.

Response: Acknowledged.

7. United States Department of the Interior, Bonneville Power Administration.

Comment: We offer no comments other than to address ourselves to the references to power losses as the result of additional flood control and the compensation therefore. We therefore suggest that you indicate in the appropriate places on pages iii, 56, and 69 that Bonneville Power Administration will be compensated for revenue forgone as a result of the power lost in providing additional flood control at Upper Baker Project.

Response: Comment acknowledged. Statements on pages iii, 56, and 69 of the draft EIS (page ii, sections 4.4.2 and 6.1.3 respectively in this final EIS) have been qualified with respect to your comment.

8. United States Department of the Interior, Bureau of Outdoor Recreation.

Comment: Pursuant to your request on February 26, 1975, we have reviewed the Draft Environmental Statement and Authorization Report on the Additional Flood Control at Upper Baker Project, Skagit River Basin, Skagit County, Washington. The draft statement adequately considers areas for which this Bureau has jurisdiction and review expertise; review of the authorization report reveals the proposal would have minimum impact on recreation facilities and opportunities.

Response: Comment acknowledged.

9. United States Department of the Interior, National Park Service.

Comment: We have reviewed the draft environmental statement and authorization report on the Additional Flood Control at Upper Baker Project, Skagit River Basin, Skagit County, Washington (ER-75/212).

We suggest that you consult the Washington State Historic Preservation Officer to determine if any sites eligible for the "National Register

of Historic Places" will be affected by the proposal. The results of this consultation should be reported and documented in the final statement.

Response: A telephone call was made on 15 May 1975 to Mr. David Hansen, Historic Preservationist with the Washington State Office of Archaeology and Historic Preservation. His evaluation is that the Baker Project will not impact any known Historical Sites in the region.

10. U.S. Environmental Protection Agency, Region X.

Comment: Outside of the benefits that should accrue to the project for flood control, no significant environmental impacts due to the proposal are foreseen.

Our comments on this draft statement have been classified LO-1, LO (Lack of Objections) 1 (Adequate Information). The classification and the date of the Environmental Protection Agency's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our review on proposed Federal actions under Section 309 of the Clean Air Act.

Response: Comments acknowledged.

11. United States Department of the Interior, Bureau of Reclamation.

Comment: We have reviewed the draft environmental impact statement and authorization report for Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington (ER 75/212). We have found no problems with the statement or report that would give rise to significant comment. Thank you for the opportunity of reviewing these statements.

Response: Comment acknowledged.

12. United States Department of Agriculture, Soil Conservation Service.

Comment: Page 41 (2.3.3.): Since "fallow generally connotes fields left uncropped during the growing season rather than those not seeded to a winter cover crop, perhaps "unprotected" might be a more appropriate term.

Response: The Final EIS has been revised under Section 2.3.3 to reflect the above qualification.

Comment: Pages ii, iii, 53: (Erosion due to drawdown.) Areas subject to rill erosion might be protected with diversions slightly above the normal maximum elevations. Erosion due to slumping, sliding, etc., are difficult to control when shorelines fluctuate.

Response: Because of existing geological conditions, we suspect that rill erosion would be very local in extent. We agree that erosion due to slumping and sliding is difficult to control, but we do not expect significant increases in such activity.

13. Department of Housing and Urban Development.

Comment: The Baker Dam Project is mentioned in the Comprehensive Land Use alternative for the Skagit River Floodplain prepared in April 1973. However, at the time you were in the process of investigation and the Regional Planning Council did not indicate whether they were for or against the project or if they considered the project as a potential to meet their overall floodplain management objectives. Thus, we think it important that their position be noted in your final statement.

Response: See comments of the Skagit Regional Planning Agency, (number 6, this section). The Baker Lake Project is an element in their overall floodplain management objectives and is supported by county citizens.

Comment: We would also like to know what geographic changes, if any, there would be in the 100-year floodplain.

Response: Because of the characteristics of the Skagit Basin and due to the limited reduction in flood stage (1 to 2 feet) made possible by the proposal, little change in the 100-year floodplain is expected.

14. United States Department of the Interior, Bureau of Indian Affairs.

Comment: A primary concern in the Skagit River Basin is the fishery resource. Assuming that the information concerning the resulting stream flow and spawning restrictions which will result from the lower drawdown of Upper Baker Reservoir is correct, it appears that the proposed flood control project will not diminish, and may enhance, the fishery environment. We feel it is very important to conduct future studies (as mentioned on page 53) to determine the impact upon Baker Lake spawners--and that the resulting data be used in future management and decision making.

Response: Comment acknowledged. Follow-up monitoring studies are programmed.

Comment: We depend upon the Fish and Wildlife Service for technical knowledge and analysis on fishery and related biologic resource matters. It would be appreciated if we could receive a copy of their comments for our files.

Response: A copy of the responses by the Department of the Interior, Fish and Wildlife Service has been sent as requested.

15. United States Department of Agriculture, Forest Service.

Comment: General Comments - The Skagit River is designated as a potential addition to the National Wild and Scenic River System under section 5 (a) of the Wild and Scenic Rivers Act. We are unable to determine the environmental impacts of each alternative considered to the potential wild and scenic river area. We recommend that the evaluation of environmental impacts consider the effects on the scenic, recreational and fish and wildlife values present in the potential river area.

Response: The Forest Service proposal to include the Skagit River System into the Wild and Scenic Rivers System and the environmental effects of the Baker Lake Project on this proposal is covered in Section 3.

Comment: If these rivers are added to the National Wild and Scenic River System, the future construction of flood control devices which would affect the free-flowing character of these rivers would be precluded. The proposed action is compatible with National System status for the Skagit. It is addressed and supported by our forthcoming draft environmental statement on the Skagit River Study. Such a discussion could be easily added to Section 3.0 on page 44.

Response: Comment acknowledged. Please see previous comment and response.

Comment: On page ii of the summary sheet, you first discuss draw-down from November 1-15. Near the bottom of the page you mention draw-down during "October and November". Drawdown should not occur until after the close of fishing season, normally October 31.

Response: Under present operating conditions, Baker Lake is normally drawn down from elevation 724.0 feet to about 721.0 feet during 1-30 October of each year. The proposal will not change this.

Comment: References to "Baker National Forest" on page 7 and "Mount Baker National Forest" on page 34, should be corrected to "Mt. Baker-Snoqualmie National Forest".

Response: Comment acknowledged. Suggested changes have been made in Sections 2.8 and 2.29 of the Final EIS.

Comment: On page 10, Section 2.12 - there are four developed Forest Service campgrounds and 12-14 undeveloped sites along Baker Lake, not two as the draft environmental statement states. You should also delete the word "area" after Glacier Peak Wilderness.

Response: The above information has been included in Section 2.12 of the Final EIS.

Comment: Reference on page ii of the summary sheet and page 60 of the DES discuss the exposure of a maximum of 12.8 feet of shoreline.

This is a vertical distance, which may be considerably greater on gently sloping shorelines. It should be noted that this exposure occurs at the worst time as far as shoreline erosion is concerned, since precipitation during this period normally occurs as rain, rather than non-erosive snow. The degree of impact might be placed in better perspective if the number of additional acres exposed could be quantified, and compared to the present acreage exposed in an average year.

Response: Final EIS has been revised to reflect lake level change of 12.8 feet.

16. State of Washington, Department of Ecology.

Comment: There appears to be a possible misunderstanding between the terms "flood-plain management" and "land-use control measures." Defining each term would make the difference more easily understood.

Response: Flood plain management includes land use controls as an element of the management program, along with early flood warning. Land use controls refer to the specific tools by which the county can implement flood plain management. These include: zoning, set-back requirements, building codes, sub-division regulations, etc.

Comment: Where structural measures are necessary to provide protection to existing development, it should be clear that land use and control measures are also necessary and required. This is to assure reduced flood damage on currently undeveloped land.

Response: Acknowledged. Section 3 of the Final EIS has been expanded to clarify the important relationship between structural flood control measures and land use control measures.

17. United States Department of the Interior, Geological Survey.

Comment: Page 9, second paragraph, sentence 1: This statement is generally true. However, recently Mt. Baker has shown increased activity and water in Boulder Creek, which drains an area near one of the new stream vents, has been reported to have a pH of near 3.7 and a specific conductance of about 500 micromhos.

Response: Final draft EIS under Section 2.10 has been expanded to reflect recent water quality studies conducted in Boulder Creek.

Comment: Page 52, first paragraph, lines 6 and 7: If "there is a potential for further reductions of present spawning..." then it would seem that redd losses would be increased.

Response: The wording of this sentence was awkward, leading to misinterpretation. The intent of the statement was to suggest that earlier drawdowns have the potential for decreasing redd losses during the sockeye salmon spawning season. The sentence has been revised

(section 4.3.5, this final EIS) to read: "Because the proposed plan would also result in earlier drawdowns than has been the case in the past, there exists the potential for further reduction in redd losses now experienced during sockeye salmon spawning season."

Comment: Page 70, first sentence: This sentence should emphasize that if levee and channel improvements are implemented, the improvement in flood protection would only occur in the river system downstream from Burlington. Flooding upstream from that point would probably still occur at a 2-3 year recurrence interval. This comment also applies to Avon Bypass (p. 70, b).

Response: Clarification of area protected by above projects has been made on page 42 of this final EIS.

18. United States Department of Commerce.

Comment: The State of Washington has indicated a desire to apply for an estuarine sanctuary grant under Section 312 of the Coastal Zone Management Act for Skagit Delta - Padilla Bay Area.

If the sanctuary was established, then future changes in flood control procedures could markedly alter flow rates and turbidity of the waters which may be detrimental to the objective of the estuarine sanctuary. We therefore suggest the Corps again contact the Department of Ecology of the State of Washington to insure that the State finds no conflict with their plans.

Response: The State of Washington Department of Ecology has reviewed the draft EIS and draft authorization report and concurs with its findings and recommendations.

19. Federal Power Commission.

Comment: We have not made an independent estimate of the energy and capacity loss incurred by the proposed plan (Alternative No. 3). We note that you have used power values furnished by this office to establish the alternative cost of replacement power for your economic evaluation. In this instance, the power values used reflect a nuclear power plant as an alternative source for the power foregone. This cost of alternative power, including annual administrative costs associated with the plan, is estimated to be \$301,000 per year, to give the proposed plan a benefit-cost ratio of 4.8. Your DEIS does not, however, indicate the manner in which they were estimated. It is suggested that the method of computation of these power losses be indicated in the final environmental impact statement and in the final authorization report.

Response: Appendix 1, page F-3 of draft report discussed method of evaluating power losses and page F-4 presented computations of value of losses. Section 4.4.2 of the Final EIS has been expanded to include this information also.

Comment: Alternative No. 2 should be discussed in greater detail. In the absence of adequate coverage of the flood-plain management program without additional storage proposal, it is extremely difficult for the reader to determine whether or not the benefits derived from flood storage at Upper Baker would be significantly greater than those benefits derived from managing the use of the flood plain.

Response: The benefits from increased flood storage at Upper Baker Project were computed on the assumption of effective flood-plain management with and without the proposal. Benefits then are residual flood damages prevented. Benefits shown for flood-plain management, alone reflects damages prevented in the absence of Upper Baker Project (see Section 6.1.3).

Comment: The consequences of protracting the length of the flood while reducing its severity are mentioned (page 3) but are not thoroughly discussed. However, the length of the February 1951 flood (page 39) is cited as a significant contributor to the severity of flood damages. These two statements appear contradictory.

Response: For minor floods with flows approximately equal to the existing safe channel capacity the duration of flood discharge will not be appreciably increased over existing conditions. In the case of major floods the existing levee system will have been breached. Increased duration of flood stage would then not make much difference in damage levels.

Comment: We suggest that the DEIS discuss the effect, if any, of the proposed revised storage allocation on the hydro power production at the downstream Lower Baker project.

Response: The power loss analysis reflects effects at Lower Baker project as shown in Puget Sound Power and Light Company's letter included in Appendix 2 of draft authorization report. The effect was determined to be minor. Section 4.4.2 of Final EIS has been expanded to cover the methodology used in power loss computations.

20. Huxley College of Environmental Studies.

Comment: I have read the Draft Environmental Impact Statement relating to the proposed change in operation of Upper Baker Dam for flood control purposes. My analysis of the benefits derived from the protection of land, structures, and business operations in Skagit County indicate a varied spatial pattern of alleviated damages. Urbanized areas of Mt. Vernon and Burlington enjoy the greater proportion of these benefits. Since information concerning the areal differentiation in damage reduction is held in the Social and Economics Section, I suggest that a condensed summary of alleviated damages by specific areas within the floodplain be made available to the interested public.

Response: Presentation of flood control benefits by damage categories are discussed in the draft authorization report. Interested public can review detailed information on specific areas at Seattle District Office.

Comment: I go on now to an area of the EIS in which recent investigations and developments make quite critical the re-examination of the potential of large landslides entering the reservoir. Section 2.35, "Bank Sloughing", indicates intergovernmental coordination between the Seattle District and the U.S. Forest Service. I trust that your Engineering Division has been notified of the increased volcanic activity on the southeast slopes of Mt. Baker. Campsites will shortly be closed in the Mt. Baker-Snoqualmie National Forest, specifically Boulder Creek Campsite on the northwest shore of Baker Lake.

Scientific investigations of the occurrence of mudflows and rock-slides associated with volcanic activity have been accomplished for Mt. Rainier and Mt. St. Helens of the Cascade Range. Currently scientists with the U.S. Geological Survey in Tacoma are preparing reports on the same subjects for the Mt. Baker Area. From personal communications of this past week, Bruce Foxworthy of the Urban Area Studies Section and Dr. Jack Hyde, consultant to the U.S.G.S. have been informed of the finalization of the Upper Baker Project Study. Their findings and tentative conclusions concerning the likelihood of large slides in the Upper Baker watershed should be solicited by your office and incorporated in any reanalysis of the Project.

Response: Section 2.36 of the Final EIS has been expanded to document recent geothermal activity on Mt. Baker. Covered also in Section 4.3.9 are the expected impacts of geothermal activity on operation of the Upper Baker Dam.

21. The Issac Walton League of America.

Comment: From our review of the project report we concur the effect on the environment would be minimal. It also appears that there would be very little adverse effect on recreation.

The comments by the fishery, the wildlife environmental and recreational agencies seem to be appropriate and we concur with them. We have no further comments to offer.

Response: Comment acknowledged.

22. Washington Environmental Council.

Comment: Our primary concern over the proposed increase in flood-control storage is with its potential effect on land use in the Skagit River floodplain. The Skagit Regional Planning Council is quoted as recommending that "rural life style of the area and its attendant recreational opportunities be preserved." We concur and are concerned that

the flood-protection and flood-relief not indirectly destroy the present character of the Skagit Valley by encouraging a take-over by residential or commercial development. As the draft statement notes, such development could also negate the initial benefits of "structural" flood-control by increasing the number of lives and the value of property at risk.

Response: The Skagit Regional Planning Agency concurs with findings and recommendations of this study (see #6 this Section). Also Skagit County Commissioners at final public meeting (8 April 1975) agreed to implement flood-plain management portion of recommended plan thereby preventing unwise or undesirable development in flood hazard areas.

Comment: The proposed action would commit the Federal Government to long-term annual expenditures of real dollars to achieve projected savings in flood losses. The projected annual savings have soared from \$300,000 to almost \$1,500,000 since the "Public Brochure" of June 1973. Details of the methods used to make the projections, including the assumptions on future development in the flood plain, are lacking in the statement. These development assumptions should be made specific, with particular attention to the upset point at which further flood-plain development would reverse the favorable cost-benefit projections for providing increased Baker River flood storage.

Response: Final EIS is not intended to provide detailed information such as suggested. However, the Authorization Report documents the assumptions and methodology used in deriving flood damage reduction benefits. The report is available to the public.

Comment: Land-use control in the Skagit River floodplain is clearly essential to the long-term effectiveness of the proposed action in reducing flood losses. The draft environmental statement does not adequately address this issue. The recommendations of the Skagit Regional Planning Council are recommendations only and are not binding. The Skagit County flood-plain zoning ordinance does not prohibit future residential or commercial development in the flood plain. The draft statement notes that second-home construction along the river is increasing upstream of Lyman and that development pressure in the Skagit Valley can be expected to increase further because of the North Cascades Highway and the National Park. Against these observations it is asserted that future development pressures on the flood plain are likely to be "minimal" because of the limited protection offered by the increase in flood storage capacity at Baker Lake. Much second-home development is at least partially speculative and even a small reduction in flood frequency could encourage further subdivision. Public knowledge that increased Baker Lake flood storage could serve as the first step in a comprehensive flood-control plan for the Skagit must only increase the likelihood of speculative subdivision.

Response: Section 3 of the final EIS has been expanded to include further discussion of land-use control measures now used by Skagit County. As regards the Upper Baker Project, the relatively small increase in flood protection afforded by its implementation is not expected to generate significant land development pressures outside of those that now exist. Also, Skagit County Commissioners have agreed to control development in flood hazard areas as a precondition to implementation of this proposal.

Comment: The Skagit River is currently under study for inclusion in the National Wild and Scenic Rivers System. Any increase in speculative development activity would have an adverse effect on the acquisition of lands and easements should the Skagit be included in the system. The draft statement does not discuss this issue either.

Response: The final EIS has been expanded in section 3 to include a description of Forest Service proposals for Wild and Scenic River Status for the Skagit, and the potential environmental effects of the Baker Lake Project on these proposals.

Comment: The appended June 1973 "Public Brochure" states that Federal participation in flood-control measures "may be made conditional upon completion of zoning and other flood-plain management activities by local authorities." The efficacy of the proposed increase in flood storage capacity at Baker Lake is dependent on such activity. We, therefore, recommend that the increase be made conditional on binding agreements by all the competent local jurisdictions to institute and maintain land-use controls that will keep flood-plain development within the levels necessary to preserve a favorable cost-benefit ratio.

Response: Skagit County has furnished a letter of intent to control development in flood hazard areas, and to annually inform residents of the basin of the true flood hazard.

Comment: We also recommend that increased storage not be implemented until the inclusion of the Skagit in the National River System is resolved.

Response: Action on both the Upper Baker and Wild and Scenic River proposals is a responsibility of Congress. As the Forest Service has already indicated the Upper Baker proposal is consistent with their recommendations, there appears to be no reason why increased flood control could not be implemented before classification.

Comment: In conclusion, we note that the proposed action is closely related to other proposed flood-control and flood-damage reduction measures in the Skagit River basin. We believe that a comprehensive environmental statement should be prepared for all these measures considered as a system, of which the lowering of

Baker Lake is the initial element. Land-use planning must precede this system to ensure that it does not destroy the resources it intends to protect.

Response: The other proposals are included in the comprehensive Water and Related Land Resources Plan prepared by the Pacific Northwest River Basins Commission for Puget Sound and Adjacent Waters for which an environmental impact statement is on file at CEQ. Each of these projects, of course, will require a separate EIS if and when they are further studied and proposed for implementation.

23. Seattle Audubon Society.

Comment: The draft EIS is slightly ambiguous as to what the effects of the reduced flooding frequency might be on flood-plain development. On the one hand, it is suggested that a sense of additional security may lead to increased flood-plain development and greater personal and economic losses. On the other hand, it is simply stated that flood-plain development would be expected to be minimal. How can one expect this to be the case?

Response: The achievement of greater flood protection has the potential of attracting and encouraging more extensive development in flood-plain areas, especially in those areas located close to existing urban centers. However, owing to the limited amount of increased protection offered by the Baker Lake project, any future development occurring as a result is expected to be minimal. So while there is a potential for further development, it is not expected to be great.

Comment: By what means will implementation of an adequate flood-plain management scheme be ensured if it is decided that additional flood control storage will be provided? Since much of the Skagit shoreline has been so attractive to summer home development upstream and other types of development downstream, the effects of additional flood storage plus an inadequate flood-plain management program or none at all could ultimately lead to greater economic losses. Would additional flood storage only be implemented contingent on an adequate program? What power does the Skagit Regional Planning Council have to implement adoption of their regulations concerning flood-plain management?

Response: Authority for effective flood-plain and shoreline management rests with Skagit County and the State of Washington. All recent activities of both give every indication that development is and will continue to be regulated in flood-hazard areas.

Comment: How will increased landslide activity and increased siltation and turbidity in the lake affect the life and water quality in Baker Lake and the waters downstream? To what extent will these increase the rate of filling of the lake and the reduction of the volume of water held by the lake? Perhaps maximum and minimum figures on this would be helpful.

Response: Our studies indicate that although downstream waters may increase slightly in turbidity because of earlier lakeshore exposure, this condition is not expected to be great enough to pose a threat to life or to pose a potential water quality problem. Likewise, we expect that the proposed pool operation change will have little effect on landsliding, sloughing or erosion. Therefore, little change in downstream water quality is anticipated from this source.

Comment: Probably the worst feature of this proposal and the one which might make early drawdown uneconomical in the long run is the resulting loss of hydroelectric power. It is stated in the draft EIS that this "would contribute cumulatively to future power shortages which may justify construction of new generating facilities." If this is in fact the case, then the impacts of this project have not been fully outlined in this report. The environmental impact of building any sort of new generating facility would be far-reaching and undoubtedly quite costly. It seems that this cost has not been taken into account in calculating the cost-benefit ratio. With sky-rocketing energy prices, it is probable that the costs will increase at a greater rate than the benefits making the additional flood storage an uneconomical addition to flood-plain management.

Response: The power losses were computed on basis of the least-costly alternative for providing replacement power and, therefore, the benefit-cost ratio reflects the worst-case condition. BPA has indicated it can provide the replacement power from the existing Federal system at about 1/6 the annual cost used in the economic analysis. While theoretically it is true new generation would be required to cover the lost capacity at Upper Baker Project; in reality, the amount lost is so small it can be easily absorbed by the system. New plants are constructed with 1,000 megawatts capacity compared to the maximum power loss of 6.3 megawatts expected at Upper Baker Project.

Comment: Upon examining the cost benefit ratios for alternatives 2 and 3, it is not clear how the average annual costs for alternative 3 are derived. It seems they should be roughly equal to the sum of costs for alternative 2 (zoning, permits, proofing, insurance) plus the cost of the additional flood control storage (Federal power revenues foregone, cost of replacement power, etc.) It would be helpful to show more clearly how the figure, \$642,000 is derived.

Response: The average annual cost figure of \$642,000 shown in the preliminary draft EIS and public brochure No. 4 for alternative 3 was arrived at by summing the average annual cost for alternative 2 (\$341,000) and the cost of additional storage at Upper Baker project (\$301,000). In our final report the costs were updated to reflect changed power values. The average annual cost for alternative 3, (including the costs of flood-plain management) are shown as \$775,000 of which \$341,000 are costs of flood-plain management and \$434,000 power loss and administrative costs associated with changed flood control operation at Upper Baker Project.

Comment: Several other questions arise. It is mentioned that assessed land values may rise with increased flood protection. Will this have the effect of crowding any farmers out?

Response: Because of the relatively small increase in overall flood protection resulting from additional flood control at Upper Baker project, the actual impact on assessed valuation is not expected to be great. Consequently, we do not expect any significant increase in agricultural land assessment values in the study area that can be attributed to the Upper Baker project.

Comment: What would the effects of lengthening the duration of the heaviest floods be?

Response: Assuming the "heaviest floods" to correspond to 50- or 100-year floods, then the proposed action of the Upper Baker project will not have much of an effect. Once levees are overtopped and land and improvements are damaged, the slight increase of a few hours in flood duration will not significantly change damage levels.

Comment: Will there be any change in the fertility of the flood plain due to less frequent flooding?

Response: Agricultural practices in the Skagit River flood plain depends upon large scale use of fertilizers. Past experience has shown that after a flood, larger quantities of fertilizers are usually required to compensate for leaching and soil dilution effects. Over the long term, a slight decrease in fertilizer usage may occur.

24. Washington Department of Fisheries.

Comment: Par. 3.b., pg. ii. The EIS refers to an exposure of 12.8 feet of shoreline which represents a vertical reduction in lake level of 12.8 feet. Much more than 12.8 feet of shoreline would be exposed along those sections of shoreline which are sloping, the amount of exposure dependent on the shore gradient. At lower elevations, much of the shoreline is not vertical. This statement does not give a clear picture of shoreline exposure.

Response: Final EIS has been revised to clarify that 12.8 feet is a lake level change.

Comment: Sec. 2.10. Lake spawning for sockeye is not successful because of the receding water levels in Baker Lake during the fall and winter.

Response: Section 2.10 has been revised to include the above information.

Comment: Sec. 4.3.3. No mention is made of the effect of increased temperatures on the rate of egg incubation.

Response: Because any increase in temperature is expected to be minor, no effect should occur on rate of egg incubation. Please see section 4.3.3 of this final EIS.

Comment: Sec. 4.3.5. With the drawdown starting November 1, little relief would be expected for lakeshore-spawning sockeye. Spawning in the artificial spawning beaches is about 1/3 completed by November 1 and our experience with sockeye in Channel Creek is that sockeye maturing in Baker Lake spawn about 2 weeks ahead of artificial beach spawners. Spawning in Channel Creek is not spread out over the long period of time as is the artificial beach spawning. Therefore, most spawning in the lake would be completed by November 1.

Response: Follow-up monitoring studies will provide factual data to enable full evaluation of effects of earlier drawdown. No benefits have been claimed, however, but merely the potential indicated.

Comment: If future studies by fisheries agencies regarding the impact of the proposed drawdown schedule show an unanticipated adverse impact on beach-spawning sockeye, provision should be made to implement Fisheries' alternative plan or a similar plan.

Response: See response above. Should unanticipated adverse effects occur, drawdown schedule would be re-evaluated.

Comment: Sec. 4.4.1. There is considerable spawning in the mainstream Skagit below Concrete during the October 1-November 15 drawdown period. The additional discharge from the Baker project may encourage spawning in areas which may be dewatered when discharge is reduced after November 15. This would mean facing the problem of redd loss in the mainstream Skagit as well as Baker Lake.

Response: The addition of an overage flow increase of 1,900 c.f.s. from the Baker project to the Skagit River will represent a total flow increase of only 12 percent in the mainstream Skagit. Because of this relatively small increase, we do not expect significant changes in downstream water levels, thereby reducing the risk of dewatering downstream spawning areas after 15 November.

Comment: Sec. 5.1. Comments on paragraph 3.b., pg. ii apply here also.

Response: See above response.

25. Washington Department of Social and Health Services.

Comment: The statement intimates an increase in flood-plain development at elevations afforded added protection by the proposed project, suggesting a desperate need for public sewers to alleviate the adverse impact on water quality. Development most assuredly will occur in the absence of restrictive statutes; however, it is presumptuous to justify flood-plain development by a reduction in flood hazard. The impact of unavoidable flooding on the economic, mental and physical well-being of flood victims and associated infrastructure is immeasurable. We do not support the encouragement of flood-plain development under any circumstance and recommend that flood control projects be preceded by mandated land-use restrictions.

Response: Skagit County, through its Flood-Plain Management responsibilities, has initiated action to control development in flood prone areas. There is no reason to believe that with the implementation of the Baker project, county control will be any less effective. In fact, because of required commitments of local sponsor (Skagit County), management measures should be more effective.

Comment: The impact of increased reservoir drawdown on insect vector propagation has not been discussed by the authors. Vector control measures for shoreline and slough areas should be given in-depth consideration.

Response: Earlier drawdown should have minimal or no effects on insect vector propagation in the Baker Lake area. As figure 1 shows, although earlier drawdown will result in a lower pool than usual during 1-15 November, the minimum pool level as recommended in our proposal is still within the past pool range elevations of previous years.

26. Washington Parks and Recreation Commission.

Comment: However, as a point of information, it appears that an error has been made on page ii-3b and on page 54-4.3.8. It is stated that a 12.8 or 13 foot vertical drop in the water level will cause about 12.8 or 13 feet of shoreline exposure. This could happen only when the bottom of the lake is a vertical cliff. If the average side slope of the lake bottom near the edge of the lake were 3 to 1, then a vertical drop of about 13 feet would expose about 39 feet, not 13 feet of lake bottom.

Response: Comment acknowledged. Subject references have been clarified to reflect a lake level change of 12.8 feet.

27. Washington State Highway Commission.

Comment: We have completed our review with respect to existing or proposed highways in the area and find no conflicts.

Response: Comment acknowledged.

9.5 Letters of Comment: The following letters were received in comment to the draft EIS and are reproduced in full here.



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

OREGON STATE OFFICE
P.O. Box 2965 (729 N.E. Oregon Street)
Portland, Oregon 97208

IN REPLY REFER TO:

1792 (911)

MAR 18 1975

District Engineer
U. S. Army Corps of Engineers
Seattle, Washington

Gentlemen:

We have reviewed the draft Environmental Impact Statement and Authorization Report for Additional Flood Control at the Upper Baker Project, Skagit River Basin, Skagit County, Washington, and we offer the following comments:

There are numerous unsurveyed islands in the Skagit River below its confluence with the Baker River and several others in Skagit Bay at the river mouth which are under BLM administration. We do not believe, though, that the proposed project will have any adverse impacts on BLM programs or plans for these Natural Resource Lands.

The Skagit River upstream from the town of Mt. Veron has been declared by the Congress as a study river for possible inclusion in the National Wild and Scenic Rivers System (PL 90-542 of 10-2-1968).

Since the proposed project will withhold water from or release water to the Skagit River, depending on the flood control cycle, the effect of the project on the possible addition to the National Wild and Scenic Rivers System should be discussed. The statement should show positive evidence of correlating this project with the scenic rivers study being conducted by the Forest Service, the lead agency for the study.

Sincerely yours,

E. J. Petersen
Acting
State Director

**Advisory Council
On Historic Preservation**

1312 F Street N.W. Suite 430
Washington D.C. 20005

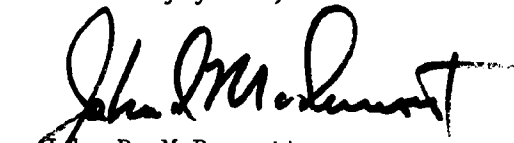
MAR 20 1975

Mr. Sydney Steinborn
Chief, Engineering Division
Corps of Engineers, Seattle District
Department of the Army
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

This is in response to your request of February 28, 1975 for comments on the draft environmental statement for the proposed Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comment to make at this time.

Sincerely yours,


John D. McDermott
Director, Office of Review
and Compliance



United States Department of the Interior

BUREAU OF MINES

EAST 315 MONTGOMERY AVENUE
SPOKANE, WASHINGTON 99207

Western Field Operation Center
March 31, 1975

Mr. Sidney Steinborn, Chief
Engineering Division
Seattle District
Corps of Engineers
4735 East Marginal Way S.
Seattle, Washington 98134

Dear Mr. Steinborn:

Personnel in this office have reviewed the Draft Environmental Statement and Authorization Report on the Additional Flood Control at Upper Baker project, Skagit River basin, Skagit County, Washington (ER-75/212).

The proposed modification in the operation of Upper Baker Dam and Reservoir for flood control purposes would not adversely affect mineral development in the Skagit River basin. Both documents adequately discuss the basin's mineral resources commensurate with the proposed action.

We offer the following suggestions for your consideration. The environmental statement should include any adverse or beneficial impacts as they relate to the proposed Skagit River Wild and Scenic River. The Forest Service provided information from the study (Authorization Report, page A-3), but a direct reference could not be found in the statement.

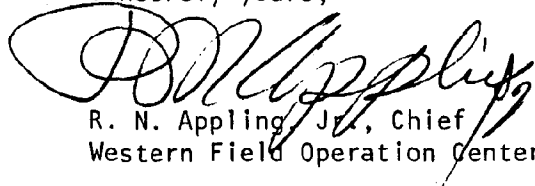
The statement does not mention the proposed Skagit Nuclear Power Project located just north of the river between Sedro Woolley and Lyman. Will the project have any adverse or beneficial effects upon the proposed power project?

Increased steam venting has occurred recently from Mt. Baker. Should this increase in venting activity continue or foreshadow a general increase in volcanic activity, the results could have a great impact upon the downstream Baker River system. Such impacts as avalanches and sudden release of waters from debris dams should be discussed in this environmental statement. One of the latest references

to the increase in geothermal activity is "Recurrent Geothermally Induced Debris Avalanches on Boulder Glacier, Mt. Baker, Washington" by David Frank, Austin Post, and Jules D. F. Friedman, Journal of Research, U.S. Geological Survey, January-February 1975, Volume 3, No. 1, pp. 77-87. Further references are listed in this paper.

These comments are intended only to provide preliminary review and technical assistance and do not constitute a formal Department of the Interior or Bureau of Mines response.

Sincerely yours,



R. N. Appling, Jr., Chief
Western Field Operation Center



United States Department of the Interior

FISH AND WILDLIFE SERVICE

1500 N.E. IRVING STREET

P.O. BOX 3737

PORTLAND, OREGON 97208

Reference: RB

April 2, 1975

District Engineer
Seattle District, Corps of Engineers
4735 E Marginal Way South
Seattle, Washington 98134

Dear Sir:

We have reviewed your draft environmental statement and authorization report on Additional Flood Control at Upper Baker project, Skagit River Basin, Skagit County, Washington, in response to Mr. Sydney Steinborn's February 26 letter to the Department's Office of Environmental Project Review. As instructed by the Department, we are providing the following comments directly to you covering items within our areas of jurisdiction and expertise.

Page 8, Section 2.10, Fisheries and Wildlife Resources (Draft statement). Steelhead fishing is mentioned as outstanding in Skagit River. Other important fish and wildlife values, including waterfowling on Skagit Flats, and salt water salmon fishing should be included. Economic values for fish and wildlife resources should also be stated as those for agriculture.

Page 11, Section 2.13, Land Use (Draft statement). Land use with associated water requirements in Skagit County should include fish and wildlife.

We appreciated the opportunity to comment on your draft statement.

Sincerely yours,

Acting Regional Director





Director / Carl N. Crouse

Assistant Directors / Ralph W. Larson
Ronald N. Andrews

Game Commission

Arthur S. Coffin, Yakima, Chairman
James R. Agen, LaConner
Elmer G. Gerken, Quincy
Claude Bekins, Seattle
Glenn Galbraith, Wellpinit
Frank L. Cassidy, Jr., Vancouver

DEPARTMENT OF GAME

600 North Capitol Way / Olympia, Washington 98504

April 2, 1975

U. S. Army Corps of Engineers
Seattle District
4735 East Marginal Way
Seattle, Washington

Gentlemen:

Your draft environmental impact statement - Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington - was reviewed by our staff as requested. Our comments follow.

Our primary concern is that the final impact statement include assessment of Baker Lake resident game fish and associated project impact. Only a "basin" species list is included at present (page 8). All analyses in terms of project impacts are for sockeye salmon. Consequently, all discussion of the proposed project are deficient, both in terms of fisheries and recreation. Specific discussion on this point follows, along with other comments on fish and wildlife.

Project Description

Consideration of timing of reservoir filling and how this will be affected by the proposed project is needed.

The report states additional flood control storage is to be available until 1 March, then filling "would begin and usually be complete by 1 April". (page ii, paragraph 1). Later the statement says filling "can" begin after March with "target date of 1 April" (page 2, paragraph 1). It goes on to say filling in "some" years "might" be later due to hydrologic conditions. This is very vague; clarification is needed in the final report.

In the past, reservoir filling was not complete until as early as May or as late as July (plates F-1 through F-5, Corps Authorization Report and/or Figure 1, DEIS). This presently may or may not be damaging some fish.

Filling too early (i.e., before emergence of Dolly Varden and kokanee fry) could adversely affect spawning success by slack-water inundation of spawning areas. If the reservoir is drawn down further than is the current practice, this could result in adverse impact on kokanee or Dolly Varden, depending on where they spawn.

Late lake filling could adversely affect rainbow and cutthroat by encouraging spawning in stream areas that are later inundated. Since only small numbers of cutthroat and rainbow "natives" apparently exist in Baker Lake, this may be happening now. But data on spawning time and locations is needed to make a conclusive statement on this one way or the other. In summary, late lake filling could be advantageous for fall spawners (Dolly Varden and kokanee) but could be detrimental to spring spawners (rainbow and cutthroat trout).

Consideration of the relationship between project proposal and maximum drawdown for power generation is also needed. You stated, in part, "Alternative 3 proposes... holding the reservoir below elevation 707.9 feet... additional storage would be available... from 15 November to 1 March..." (page 2, paragraph 1). How far below elevation 707.8 feet would the reservoir be drafted as opposed to present conditions? We expect that drawdowns more severe or lengthy than presently experienced will adversely affect carrying capacity and productivity of the lake.

Environmental Setting Without the Project

You may wish to mention the following information on Baker Lake's resident fishery in the Fisheries and Wildlife Resources section (pages 8-10). Kokanee, Dolly Varden, rainbow, and cutthroat trout are all present in Baker Lake as self-sustaining populations (legal rainbows are reared and released for a put-and-take fishery, as you have stated). Kokanee are the most important species present; they sustain the largest naturally-produced harvest by far. Dolly Varden are harvested in smaller numbers but achieve "trophy size" and are specifically sought after by some anglers. Self-sustaining rainbow and cutthroat populations are small and contribute little to overall harvest.

The 1971 Baker Lake Creel Census (James Cummins, WDG, Dec. 1971) reported an estimated catch of 9,826 rainbow trout from a plant of 55,000 catchable size fish, 10,658 kokanee and 1,524 miscellaneous species - a total of 21,998 fish for the census period (July 1 through September 6, 1971). The survey showed the average angler fished 2.94 hours and caught 2.73 fish per trip (1.21 rainbow and 1.40 kokanee; average catch per trip.). This yielded a total projected time of 25,538 man hours of fishing during the census period.

April 2, 1975

Many of the types of wildlife which may use Baker Lake and surrounding region are mentioned in this section. Swan should be added. You may also wish to mention that osprey nesting is reported in the east shore of Baker Lake. Baker Lake vicinity probably supports a fair number of ruffed grouse and a good population of raccoon (Brown, Judith, Fish and Wildlife Resources of Mount Baker National Forest, Applied Research Bul. No. 2., Mar. 1974, WDG, pages 41, 42, 48).

Environmental Impact of the Proposed Action

In addition to information on impacts on Baker Lake's resident fishery requested above, we suggest the final impact statement also include a discussion of project effect on turbidity conditions in Lower Baker and Skagit Rivers.

Future studies to determine extent of impacts on Baker Lake spawners, if the proposed plan is implemented, are mentioned on page 53. We suggest the scope of the study be expanded to include resident game fish stocks which heretofore appear to have been overlooked.

Your assessment of effects on wildlife resources (page 53) addresses effects which may be sustained at Baker Lake. A decrease in open water space available to waterfowl will be experienced; you may wish to mention this also. Secondary impacts on wildlife should be acknowledged. The proposal seeks to provide additional flood protection to nearly 100,000 acres of floodplain and thus opens a potential (however small) for increased loss of wildlife resources existing in this floodplain area. The proposal will also help pave the way for stream and channel improvements and the Avon Bypass, projects which may result in adverse impacts on fish and wildlife.

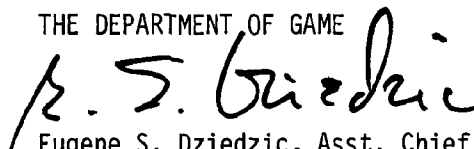
Unavoidable Adverse Environmental Impacts

We question the failure to acknowledge adverse impacts on fishery resources, covered in other areas of your report.

Thank you for sending your draft and providing us an opportunity to comment. We hope our comments will be helpful.

Sincerely,

THE DEPARTMENT OF GAME



Eugene S. Dziedzic, Asst. Chief
Environmental Management Division

ESD:jb

cc: E. A. Chitwood
Agencies



TELEPHONE (206) 336-2188
120 W. KINCAID, ANNEX II
MOUNT VERNON, WASH. 98273

ANACORTES
BURLINGTON
LA CONNER

MOUNT VERNON
PORT OF ANACORTES
PORT OF SKAGIT COUNTY

SEDRO-WOOLLEY
SKAGIT COUNTY
SKAGIT P.U.D. NO. 1

April 3, 1975

Department of the Army
Seattle District, Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Attention: Mr. Jim Newman
Environmental Coordinator

Subject: Draft Environmental Statement
additional Flood Control
Upper Baker Project
Skagit River Basin, Washington

The Skagit Regional Planning Agency has reviewed the Subject Draft Environmental Statement and concurs in general with the analysis and findings presented. We believe that the draft statement presents a fair statement of the facts as they exist at this time.

We further believe that the level of flood protection offered by a combination of the additional flood storage in Upper Baker, flood-plain management, and downstream levee and channel improvements is the minimum protection acceptable to the residents of the Skagit Valley.

Thank you for the opportunity to offer these comments.

Sincerely,

Robert C. Schofield, Executive Director
SKAGIT REGIONAL PLANNING COUNCIL



OFFICE OF
THE ADMINISTRATOR

United States Department of the Interior

BONNEVILLE POWER ADMINISTRATION
P.O. BOX 3621, PORTLAND, OREGON 97208

In reply refer to: AJ

APR 7 1975

Mr. Sydney Steinborn
Chief, Engineering Division
Seattle District
Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

Thank you for the opportunity to review your draft environmental impact statement on Additional Flood Control at Upper Baker Project.

We offer no comments other than to address ourselves to the references to power losses as the result of additional flood control and the compensation therefor. We recently raised a similar question with reference to the draft public brochure on this subject in a letter dated March 27, 1975, to Mr. Frank J. Urabeck. The letter, a copy of which is attached, explains our concerns. Mr. Urabeck communicated his appreciation of the problem to Mr. Kropitser of this office and graciously agreed to reflect our comments in the public brochure. We therefore suggest that you indicate in the appropriate places on pages iii, 56, and 69 that Bonneville Power Administration will be compensated for revenue forgone as a result of the power lost in providing additional flood control at Upper Baker Project.

Sincerely yours,

Administrator

Enclosure:
Letter of March 27, 1975, to Mr. Urabeck





UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION

NORTHWEST REGION

APR 6 1975

IN REPLY REFER TO:

E3027
ER-75/212

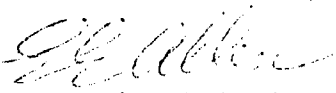
217 (10-10-74) ERM-920
10-10-74

Sydney Steinborn, Chief
Engineering Division
Department of the Army
Seattle District Corps of
Engineers
4735 E. Marginal Way So.
Seattle, Washington 98134

Dear Mr. Steinborn:

Pursuant to your request of February 26, 1975, we have reviewed the Draft Environmental Statement and Authorization Report on the Additional Flood Control at Upper Baker Project, Skagit River Basin, Skagit County, Washington. The draft statement adequately considers areas for which this Bureau has jurisdiction and review expertise; review of the authorization report reveals the proposal would have minimum impact on recreation facilities and opportunities.

Sincerely yours,


Maurice H. Lundy
Regional Director



IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE

Pacific Northwest Region
Fourth and Pike Building
Seattle, Washington 98101

L7619
(PNR)CAE

April 9, 1975

Mr. Sydney Steinborn
Chief, Engineering Division
Seattle District
Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

We have reviewed the draft environmental statement and authorization report on the Additional Flood Control at Upper Baker Project, Skagit River Basin, Skagit County, Washington (ER-75/212).

We suggest that you consult the Washington State Historic Preservation Officer to determine if any sites eligible for the "National Register of Historic Places" will be affected by the proposal. The results of this consultation should be reported and documented in the final statement.

Sincerely yours,

Glenn D. Gallison
Associate Regional Director,
Cooperative Activities

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101



REPLY TO
ATTN OF:

10RAOFA - M/S 623

April 9, 1975

Mr. Frank Urabeck, Study Manager
Department of the Army
Seattle District, Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Urabeck:

We have reviewed the draft environmental impact statement on, "Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington."

This project merely proposes to utilize a portion of the existing storage space in PSP&L's Upper Baker River Project for flood control. The only change in current operation is that the reservoir will be intentionally drawn down in late fall to make flood storage available through the winter and early spring months. Power revenues foregone will be replaced at the expense of the Federal Government.

Outside of the benefits that should accrue to the project for flood control, no significant environmental impacts due to the proposal are foreseen.

Our comments on this draft statement have been classified LO-1, LO (Lack of Objections) 1 (Adequate Information). The classification and the date of the Environmental Protection Agency's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our review on proposed Federal actions under Section 309 of the Clean Air Act.

Thank you for the opportunity to review this draft statement.

Sincerely,

Walter D. Jaspers
Director
Office of Federal Affairs



United States Department of the Interior
BUREAU OF RECLAMATION

PACIFIC NORTHWEST REGIONAL OFFICE
FEDERAL BUILDING & U.S. COURTHOUSE
BOX 043-550 WEST FORT STREET
BOISE, IDAHO 83724

IN REPLY
REFER TO: 160
120.1

APR 10 1975

District Engineer
Seattle District, Corps of Engineers
Department of the Army
4735 East Marginal Way South
Seattle, Washington 98134

Dear Sir:

We have reviewed the draft environmental impact statement and authorization report for Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington (ER 75/212). We have found no problems with the statement or report that would give rise to significant comment. Thank you for the opportunity of reviewing these statements.

Sincerely yours,

H. R. Stivers

Assistant

Regional Director

cc: Commissioner, Attn: 150
Director, Office of Environmental Project Review, USDI, WDC



UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Room 360 U.S. Courthouse, Spokane, Washington 99201

April 10, 1975

Sydney Steinborn
Chief, Engineering Division
Department of the Army
Seattle District
Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Sir:

Your draft environmental impact statement on Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington was reviewed by our specialists. Inasmuch as the draft is concerned with flood control rather than the vegetative or agricultural aspects or related effects, our comments relate to those areas within our expertise.

Page 41 (2.3.3.): Since "fallow generally connotes fields left uncropped during the growing season rather than those not seeded to a winter cover crop, perhaps "unprotected" might be a more appropriate term.

Pages ii, iii, 53: (Erosion due to drawdown.) Areas subject to rill erosion might be protected with diversions slightly above the normal maximum elevations. Erosion due to slumping, sliding, etc., are difficult to control when shorelines fluctuate.

The other information relative to affected soils appears to be adequately addressed.

If we can be of further assistance to you on these or other projects, please let us know. The opportunity to review your draft is appreciated.

Sincerely,

Galen S. Bridge

Galen S. Bridge
State Conservationist





DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
ARCADE PLAZA BUILDING, 1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101

April 10, 1975

REGION X

Office of Community
Planning and Development

IN REPLY REFER TO:

10D

Mr. Jim Newman
Environmental Coordinator
Seattle District Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Newman:

Subject: Draft Environmental Statement Additional Flood Control at
Upper Baker Project

We have reviewed the statement submitted with your February 26, 1975 letter requesting comments by April 14th.

The proposed action is to increase the flood control storage space at the Upper Baker Reservoir from 16,000 acre feet to an additional 58,000 acre feet by increasing the reservoir drawdown during November 1 to November 15 of each year.

The Baker Dam Project is mentioned in the Comprehensive Land Use alternative for the Skagit River Floodplain prepared in April 1973. However, at the time you were in the process of investigation and the Regional Planning Council did not indicate whether they were for or against the project or if they considered the project as a potential to meet their overall floodplain management objectives. Thus, we think it important that their position be noted in your final statement.

We would also like to know what geographic changes, if any, there would be in the 100 year floodplain.

We defer to other agencies to comment on other aspects of your project not within our jurisdiction or expertise. Thanks for the opportunity to comment.

Sincerely,

James L. Young
Regional Administrator



IN REPLY REFER TO:
Land Services

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS

PORTLAND AREA OFFICE

POST OFFICE BOX 3785

PORTLAND, OREGON 97208

APR 10 1975

Mr. Sidney Steinborn
Chief, Engineering Division
Seattle District, Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

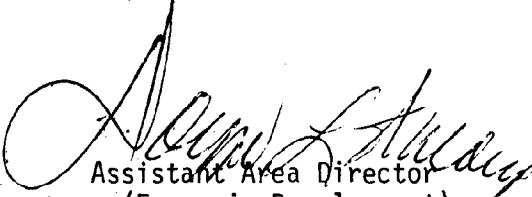
Dear Mr. Steinborn:

This is in reference to your draft environmental statement and authorization report on the additional flood control at Upper Baker Project, Skagit River Basin, Skagit County (ER 75/212).

A primary concern in the Skagit River Basin is the fishery resource. Assuming that the information concerning the resulting stream flow and spawning restrictions which will result from the lower draw-down of Upper Baker Reservoir is correct, it appears that the proposed flood control project will not diminish, and may enhance, the fishery environment. We feel it is very important to conduct future studies (as mentioned on page 53) to determine the impact upon Baker Lake spawners--and that the resulting data be used in future management and decision making..

We depend upon the Fish and Wildlife Service for technical knowledge and analysis on fishery and related biologic resource matters. It would be appreciated if we could receive a copy of their comments for our files.

Sincerely yours,


Assistant Area Director
(Economic Development)



UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Region 6
P.O. Box 3623, Portland, Oregon 97208



8420
April 11, 1975

Mr. Sydney Steinborn
Chief, Engineering Division
Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

At your request we have reviewed the draft environmental statement on Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington. Our comments follow:

1. General Comments - The Skagit River is designated as a potential addition to the National Wild and Scenic River System under section 5 (a) of the Wild and Scenic Rivers Act. We are unable to determine the environmental impacts of each alternative considered to the potential wild and scenic river area. We recommend that the evaluation of environmental impacts consider the effects on the scenic, recreational and fish and wildlife values present in the potential river area.

If these rivers are added to the National Wild and Scenic River System, the future construction of flood control devices which would affect the free-flowing character of these rivers would be precluded. The proposed action is compatible with National System status for the Skagit. It is addressed and supported by our forthcoming draft environmental statement on the Skagit River Study. Such a discussion could be easily added to Section 3.0 on page 44.


2. On page ii of the summary sheet, you first discuss drawdown from November 1-15. Near the bottom of the page you mention drawdown during "October and November". Drawdown should not occur until after the close of fishing season, normally October 31.
3. References to "Baker National Forest" on page 7 and "Mount Baker National Forest" on page 34, should be corrected to "Mt. Baker-Snoqualmie National Forest".
4. On page 10, Section 2.12 - there are four developed Forest Service campgrounds and 12-14 undeveloped sites along Baker Lake, not two as

the draft environmental statement states. You should also delete the word "area" after Glacier Peak Wilderness. The same comment is valid for page 12 of the authorization report and B-10 of Appendix 1.

5. Reference on page ii of the summary sheet and page 60 of the DES discuss the exposure of a maximum of 12.8 feet of shoreline. This is a vertical distance, which may be considerably greater on gently sloping shorelines. It should be noted that this exposure occurs at the worst time as far as shoreline erosion is concerned, since precipitation during this period normally occurs as rain, rather than non-erosive snow. The degree of impact might be placed in better perspective if the number of additional acres exposed could be quantified, and compared to the present acreage exposed in an average year.
6. Page 5 of the Appendix should be corrected to read "National Wild and Scenic River System."

We appreciate the opportunity to review you D.E.S. and trust our comments will assist you in preparing the final statement.

Sincerely,


FOR T.A. SCHLAPFER
Regional Forester

State of
Washington
Department
of Ecology



April 14, 1975

Raymond J. Eineigl
Colonel, U.S. Army Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Subject: Upper Baker Project, Skagit River Basin

Dear Colonel Eineigl:

We have reviewed the Draft Authorization Report, Public Brochure and the Draft Environmental Impact Statement for the Upper Baker Project, Skagit River Basin and concur with the findings and recommendation contained therein.

As you are aware, the Department of Ecology is designated by Governor Evans to represent the State on these matters. In a coordinated review we have found no opposition to the recommended alternative and find that it will generally increase multiple-objective benefits (except for minor power losses).

Attached are comments on the Draft EIS that may be of assistance to you in preparing your final statement.

We, therefore, encourage early implementation of Alternative Three-Flood Plain Management with additional flood control storage at the Upper Baker Project.

Sincerely,

John A. Biggs
Director
Department of Ecology

JAB:JWS:tg
Attachment
cc: Denny Lundblad ✓
Ed Hammersmith
Duane Wegner
Skagit County Planning Office

April 14, 1975

Department of Ecology Comments:

U.S. Army Corps of Engineer's
Draft Environmental Impact Statement
Additional Flood Control
at Upper Baker Project
Skagit River Basin, Washington

Thank you for the opportunity to review your document. It appears to be an excellent presentation of the proposed action thus indicating considerable forethought in its preparation.

The comments we have are as follows:

1. There appears to be a possible misunderstanding between the terms "flood plain management" and "land use control measures." Defining each term would make the difference more easily understood.
2. Where structural measures are necessary to provide protection to existing development, it should be clear that land use and control measures are also necessary and required. This is to assure reduced flood damage on currently undeveloped land.

We hope the comments will be helpful to you. If we can be of further service to you, please contact Mr. David Thompson of our Environmental Review Section.



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

ER-75/212

APR 15 1975

Mr. Sydney Steinborn, Chief
Engineering Division
Seattle District
Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

We have reviewed the draft environmental impact statement on Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington, and the draft authorization report, as you requested in a letter of February 26 to the Office of Environmental Project Review. We offer the following comments for your consideration.

Environmental impacts related to geologic conditions are adequately discussed in the environmental statement.

We find the subject documents to be adequate and generally accurate in their assessment of the impact of the proposed actions on water resources of the area. However, we submit the following specific comments.

Draft Environmental Statement

Page 9, second paragraph, sentence 1: This statement is generally true. However, recently Mt. Baker has shown increased activity and water in Boulder Creek, which drains an area near one of the new steam vents, has been reported to have a pH of near 3.7 and a specific conductance of about 500 micromhos.

Page 52, first paragraph, lines 6 and 7: If "there is a potential for further reductions of present spawning . . ." then it would seem that redd losses would be increased.

Page 70, first sentence: This sentence should emphasize that if levee and channel improvements are implemented, the improvement in flood



protection would only occur in the river system downstream from Burlington. Flooding upstream from that point would probably still occur at a 2-3 year recurrence interval. This comment also applies to Avon Bypass (p. 70, b).

Authorization Report

Page 28: We suggest that the table be titled "Historical Skagit River Floods near Mt. Vernon."

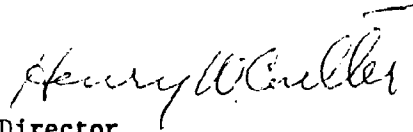
Appendix 1, C-22, Table C-4: For the Skagit River near Concrete, the "crest discharge" should be 139,000 cfs.

We thank you for the opportunity to review and comment on these documents.

Sincerely yours,

Acting

Director





UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

April 21, 1975

Mr. Sydney Steinborn
Chief, Engineering Division - Seattle District
Corps of Engineers
U. S. Department of the Army
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

The draft environmental impact statement "Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington," which accompanied your letter of February 26, 1975, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

GENERAL COMMENTS

The Department of Commerce, Office of Coastal Zone Management, finds the subject document adequately describes the project, the means of coordination, and the alternatives to the project.

The State of Washington has indicated a desire to apply for an estuarine sanctuary grant under Section 312 of the Coastal Zone Management Act for Skagit Delta - Padilla Bay Area.

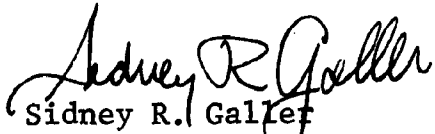
If the sanctuary was established, then future changes in flood control procedures could markedly alter flow rates and turbidity of the waters which may be detrimental to the objective of the estuarine sanctuary. We therefore suggest the Corps again contact the Department of Ecology of the State of Washington to insure that the State finds no conflict with their plans.



-2-

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving two copies of the final statement.

Sincerely,

A handwritten signature in cursive script, reading "Sidney R. Galler". The signature is written in dark ink and is positioned above the printed name.

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

FEDERAL POWER COMMISSION
REGIONAL OFFICE
555 BATTERY STREET, ROOM 415
SAN FRANCISCO, CALIF. 94111

April 23, 1975

Col. Raymond J. Eineigl
District Engineer
Seattle District, Corps of Engineers
4735 East Marginal Way
Seattle, WA 98134

Dear Sir:

We have reviewed your Draft Environmental Impact Statement and the Draft Authorization Report on the Additional Flood Control at Upper Baker Project, which were furnished with your letter of February 26, 1975.

These comments on your Draft Environmental Impact Statement by the San Francisco Regional Office of the Federal Power Commission's Bureau of Power are made in accordance with the National Environmental Policy Act of 1969, and the August 1, 1973, Guidelines of the Council on Environmental Quality. Our principal concern with developments affecting land and water resources is the possible effect of such development on bulk electric power facilities, including existing and potential hydroelectric developments, and on natural gas pipeline facilities. The action proposed in this draft statement affects the operation of a Federal Power Commission licensed project.

Your proposed plan would modify the present operation of the Upper Baker Reservoir, which is part of FPC Licensed Project No. 2150, by providing for 58,000 additional acre-feet of flood control storage by increasing reservoir drawdown during the period November 1-15 of each year. Pool elevation during this drawdown period would be reduced from about elevation 720.6 feet to elevation 707.8 feet. The additional flood control storage obtained would be available until March 1 of each year, when refilling would begin, and normally be completed April 1. You have estimated that the proposed plan would result in a capacity loss of up to 6.3 megawatts, and an energy loss of 1.117 average megawatts annually.

The present operation of the Upper Baker Reservoir provides for 16,000 acre-feet of space for flood regulation between November 1 and March 1, as specified by the Project License. Article 32 of the License further provides for up to a maximum of 84,000 acre-feet of flood control space in the reservoir during the storage drawdown season, as may be requested by the Corps of Engineers, provided suitable arrangements are made to compensate the Licensee.

We have not made an independent estimate of the energy and capacity loss incurred by the proposed plan (Alternative No. 3). We note that you have used power values furnished by this office to establish the alternative cost of replacement power for your economic evaluation. In this instance, the power values used reflect a nuclear power plant as an alternative source for the power foregone. This cost of alternative power, including annual administrative costs associated with the plan, is estimated to be \$301,000 per year, to give the proposed plan a benefit-cost ratio of 4.8. Your DEIS does not, however, indicate the manner in which the power losses were estimated. It is suggested that the method of computation of these power losses be indicated in the final environmental impact statement and in the final authorization report.

The proposed plan would provide for reimbursement to Puget Sound Power & Light for the power losses through replacement power from the Bonneville Power Administration. Your estimated annual cost of this power is \$80,000. As previously noted, the FPC license for the project allows for additional flood control space in the Upper Baker Reservoir, provided that suitable arrangements shall have been made to compensate the Licensee.

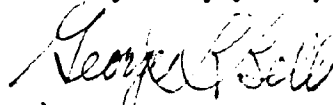
Alternative No. 2 should be discussed in greater detail. In the absence of adequate coverage of the flood plain management program without additional storage proposal, it is extremely difficult for the reader to determine whether or not the benefits derived from flood storage at Upper Baker would be significantly greater than those benefits derived from managing the use of the flood plain.

The consequences of protracting the length of the flood while reducing its severity are mentioned (page 3) but are not thoroughly discussed. However, the length of the February 1951 flood (page 39) is cited as a significant contributor to the severity of flood damages. These two statements appear contradictory.

We suggest that the DEIS discuss the effect, if any, of the proposed revised storage allocation on the hydro power production at the downstream Lower Baker project.

On page C-3, Appendix 1 of the Authorization Report, the installed capacity shown for Lower Baker should be changed from 103,000 kilowatts to 64,000 kilowatts. This revised capacity is due to the abandonment of two powerhouse units following severe landslide damage in 1965.

Very truly yours,



Deputy

(Acting for) M. Frank Thomas
Regional Engineer

HUXLEY COLLEGE OF ENVIRONMENTAL STUDIES

A DIVISION OF WESTERN WASHINGTON STATE COLLEGE

April 22, 1975

Mr. Frank J. Urabeck
Study Manager - Upper Baker Project
Department of the Army
Seattle District, Corps of Engineers
4735 East Marginal Way South
Seattle, Washington

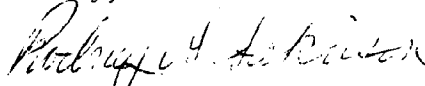
Dear Mr. Urabeck:

I have read the Draft Environmental Impact Statement relating to the proposed change in operation of Upper Baker Dam for flood control purposes. My analysis of the benefits derived from the protection of land, structures, and business operations in Skagit County indicates a varied spatial pattern of alleviated damages. Urbanized areas of Mt. Vernon and Burlington enjoy the greater proportion of these benefits. Since information concerning the areal differentiation in damage reduction is held in the Social and Economics Section, I suggest that a condensed summary of alleviated damages by specific areas within the floodplain be made available to the interested public.

I go on now to an area of the EIS in which recent investigations and developments make quite critical the reexamination of the potential of large landslides entering the reservoir. Section 2.35, "Bank Sloughing," indicates inter-governmental coordination between the Seattle District and the U.S. Forest Service. I trust that your Engineering Division has been notified of the increased volcanic activity on the southeast slopes of Mt. Baker. Campsites will shortly be closed in the Mt. Baker-Snoqualmie National Forest, specifically Boulder Creek Campsite on the northwest shore of Baker Lake.

Scientific investigations of the occurrence of mudflows and rockslides associated with volcanic activity have been accomplished for Mt. Rainier and Mt. St. Helens of the Cascade Range. Currently scientists with the U.S. Geological Survey in Tacoma are preparing reports on the same subjects for the Mt. Baker Area. From personal communications of this past week, Bruce Foxworthy of the Urban Area Studies Section and Dr. Jack Hyde, consultant to the U.S.G.S. have been informed of the finalization of the Upper Baker Project Study. Their findings and tentative conclusions concerning the likelihood of large slides in the Upper Baker watershed should be solicited by your office and incorporated in any reanalysis of the Project.

Sincerely,



Rodney G. Sakrison
Teaching Assistant
Environmental Planning

RGS/kf

BELLINGHAM, WASHINGTON 98225 · AREA CODE 206 676-3520



The Izaak Walton League of America

INCORPORATED
BUILDING A BETTER OUTDOOR AMERICA

April 15, 1975

District Engineer
Seattle District, Corps of Engineers
4735 East Marginal Way South
Seattle, Washington 98134

Dear Gentlemen:

Thank you for your letter of February 26, 1975 regarding the upper Baker Project, Skagit River Basin. We appreciate the opportunity to review your proposed report on the Project.

As is described in your report the proposal is to draw the reservoir down approximately 13 feet during October and November to provide 58,000 acre feet of additional flood control storage during the winter months. Before it would normally be drawn down for the generation of hydro power.

From our review of the project report we concur the effect on the environment would be minimal. It also appears that there would be very little adverse effect on recreation.

The comments by the fishery, the wildlife environmental and recreational agencies seem to be appropriate and we concur with them. We have no further comments to offer.

Sincerely,

Larry L. Petersen
President
Greater Seattle Chapter
of the Izaak Walton
League of America

LLP:dsp



WASHINGTON ENVIRONMENTAL COUNCIL

107 SOUTH MAIN, SEATTLE, WA. 98104 / 623-1483

April 17, 1975

AAUW
Allied Arts Council
Alps - Ellensberg
AIA
AIP
Cascade Wilderness Club
Citizens Against Freeways
CARHT
Clean Air for Washington
Coalition Against Oil Pollution
Committee for Holly
Environment
Concerned about Trident
Cougar Lake Wilderness
Alliance
Earth Care Organization
East Side League
Environmental Committee on
Survival
Environmental Qual Coun
Everett JC's
Evergreen Fly Fishing Club
Hood Canal Env. Council
Intermountain Alpine Club
Junior League of Seattle
Junior League of Spokane
King Co. Conservation
Education Com.
Lake Stickney Garden Club
Lance Belfair
Lower Col. Audubon Society
Marine Technology Society
Montlake Community Club
The Mountaineers
North Cascades Conservation
Council
Northwest Steelheaders
Nisqually Delta Assoc.
Oak Harbor Garden Club
Olympic Park Assoc.
Olympic Peninsula Audubon
Society
Oroville Sportsmen's Assoc.
Pacific County Env. Coun.
Pierce County Action
Pilchuck Audubon Society
Planned Parenthood Center
Poggie Club of Washington
Progressive Animal Welfare
Society
Protect the Peninsula's Future
The Parmigans
Puget Sound Beach
Preservation
Puget Sound Fly Fishing Club
Puget Sound Mycological
Society
Pullman League of Women
Voters
Queen Anne Garden Club
Ravenna Community Assoc.
Richland Rod and Gun Club
Save Cypress Island Comm.
Seattle Audubon Society
Seattle Garden Club
Seattle JC's
Seattle Veterinary Med. Assoc.
Shoreline League
Sierra Club - PNW
Skagit Alpine Club
Salty Beachcombers Club
SW Wash. Env. Action Team
Spokane Mountaineers
Spokane Audubon Society
Steelhead Trout Club
Tahoma Audubon Society
Thurston Action Committee
Wash. Alpine Club
Wash. Assoc. of College
Biology Teachers
Wash. Assoc. of Sanitarians
Wash. Kayak Club
Wash. Roadside Council
Wash. Fed. of Garden Clubs
Wash. Recreation and Trails
Assoc.
Wash. State Labor Council
Yakima River Conservancy
Zero Population Growth

Army Corps of Engineers, Seattle District
4735 East Marginal Way South
Seattle, Washington 98134

Dear Mr. Steinborn:

Thank you for the opportunity to review and comment upon the draft environmental statement, "Additional Flood Control at Upper Baker Project, Skagit River Basin, Washington."

Our primary concern over the proposed increase in flood-control storage is with its potential effect on land use in the Skagit River floodplain. The Skagit Regional Planning Council is quoted as recommending that "the rural life style of the area and its attendant recreational opportunities be preserved." We concur and are concerned that the flood-protection and flood-relief not indirectly destroy the present character of the Skagit Valley by encouraging a take-over by residential or commercial development. As the draft statement notes, such development could also negate the initial benefits of "structural"

17 April 1975

Page 2

flood-control by increasing the number of lives and the value of property at risk.

The proposed action would commit the Federal Government to long-term annual expenditures of real dollars to achieve projected savings in flood losses. The projected annual savings have soared from \$300,000 to almost \$1,500,000 since the "Public Brochure" of June 1973. Details of the methods used to make the projections, including the assumptions on future development in the floodplain, are lacking in the statement. These development assumptions should be made specific, with particular attention to the upset point at which further floodplain development would reverse the favorable cost-benefit projections for providing increased Baker River flood storage.

Land-use control in the Skagit River floodplain is clearly essential to the long-term effectiveness of the proposed action in reducing flood losses. The draft environmental statement does not adequately address this issue. The recommendations of the Skagit Regional Planning Council are recommendations only and are not binding. The Skagit County floodplain zoning ordinance does not prohibit future residential or commercial development in the floodplain. The draft statement notes that second-home construction along the river is increasing upstream of Lyman and that development pressure in the Skagit Valley can be expected to increase further because of the North Cascades Highway and the National Park. Against these observations it is asserted that

future development pressures on the floodplain are likely to be "minimal" because of the limited protection offered by the increase in flood storage capacity at Baker Lake.

Much second-home development is at least partially speculative and even a small reduction in flood frequency could encourage further subdivision. Public knowledge that increased Baker Lake flood storage could serve as the first step in a comprehensive flood-control plan for the Skagit must only increase the likelihood of speculative subdivision.

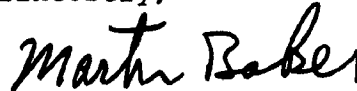
The Skagit River is currently under study for inclusion in the National Wild and Scenic Rivers System. Any increase in speculative development activity would have an adverse effect on the acquisition of lands and easements should the Skagit be included in the system. The draft statement does not discuss this issue either.

The appended June 1973 "Public Brochure" states that Federal participation in flood-control measures "may be made conditional upon completion of zoning and other floodplain management activities by local authorities." The efficacy of the proposed increase in flood storage capacity at Baker Lake is dependent on such activity. We therefore recommend that ~~the increase~~ ^{it} be made conditional on binding agreements by all the competent local jurisdictions to institute and maintain land-use controls that will keep floodplain development within the levels necessary to preserve

17 April 1975
Page 4

a favorable cost-benefit ratio. We also recommend that increased storage not be implemented until the inclusion of the Skagit in the National River System is resolved. In conclusion, we note that the proposed action is closely related to other proposed flood-control and flood-damage reduction measures in the Skagit River basin. We believe that a comprehensive environmental statement should be prepared for all these measures considered as a system, of which the lowering of Baker Lake is the initial element. Land-use planning must precede this system to ensure that it does not destroy the resources it intends to protect.

Sincerely,

A handwritten signature in cursive script that reads "Martin Baker".

Martin Baker

Executive Director

1014 NE 61 St.
Seattle, WA 98115
9 April 1975

Raymond J. Eineigl
District Engineer
Seattle District Corps of Engineers
4735 East Marginal Way S.
Seattle, WA 98134

Dear Colonel Eineigl:

Upon reviewing the environmental impact statement for the Upper Baker Project, a number of questions and problems arise related to the proposed action. As a result of these, we would like to recommend a more careful evaluation and consideration of alternative 2 (Flood Plain Management Alone). In the long run, this may be the most valuable economically, as I will point out.

The draft EIS is slightly ambiguous as to what the effects of the reduced flooding frequency might be on flood plain development. On the one hand it is suggested that a sense of additional security may lead to increased flood plain development and greater personal and economic losses. On the other hand, it is simply stated that flood plain development would be expected to be minimal. How can one expect this to be the case?

By what means will implementation of an adequate flood plain management scheme be ensured if it is decided that additional flood control storage will be provided? Since much of the Skagit shoreline has been so attractive to summer home development upstream and other types of development downstream the effects of additional flood storage plus an inadequate floodplain management program or none at all could ultimately lead to greater economic losses. Would additional flood storage only be implemented contingent on an adequate program? What power does the Skagit Regional Planning Council have to implement adoption of their regulations concerning flood plain management?

How will increased landslide activity and increased siltation and turbidity in the lake affect the life and water quality in Baker Lake and the waters downstream? To what extent will these increase the rate of filling of the lake and the reduction of the volume of water held by the lake? Perhaps maximum and minimum figures on this would be helpful.

Probably the worst feature of this proposal and the one which might make early drawdown uneconomical in the long run is the resulting loss of hydroelectric power. It is stated in the draft EIS that this "would contribute cumulatively to future power shortages which may justify construction of new generating facilities." If this is in fact the case, then the impacts of this project have not been fully outlined in this report. The environmental impact of building any sort of new generating facility would be far-reaching and undoubtedly quite costly. It seems that this cost has not been taken into account in calculating the cost-benefit ratio. With sky-rocketing energy prices it is probable that the costs will increase at a greater rate than the benefits making the additional flood storage an uneconomical addition to flood plain management.

Upon examining the cost benefit ratios for alternatives 2 and 3, it is not clear how the average annual costs for alt. 3 are derived. It seems they should be roughly equal to the sum of costs for alternative 1 (zoning, permits, proofing, insurance) plus the cost of the additional flood control storage (federal power revenues forgone, cost of replacement power, etc.) It would be helpful to show more clearly how the figure, \$642,000, is derived.

Several other questions arise. It is mentioned that assessed land values may rise with increased flood protection. Will this have the effect of crowding any farmers out? What would the effects of lengthening the duration of the heaviest floods be? Will there be any change in the fertility of the floodplain due to less frequent flooding?

Upper Baker Project

page 3.

Taking into consideration many of the points raised above, it appears that flood plain management alone would provide much-needed relief with mostly positive environmental impacts, while the addition of extra storage in Baker Lake would add significant negative impacts and increase the economic benefits only slightly (and perhaps not at all in the long run). While alternative 3 would be far superior to alternatives such as a dam on the Sauk or channel "improvement" on the Skagit, it would contribute to environmental deterioration and would perhaps lead to other more devastating projects such as the two such mentioned. Flood plain management alone would be a good long term solution. With the proper controls, uses of the flood plain would eventually all conform to the natural geologic processes that occurs there and the ongoing war against the river would no longer be necessary.

We hope these points will be considered in the final environmental impact statement.

Sincerely,



Doug Wechsler
Conservation Committee
Seattle Audubon Society



WASHINGTON
Department of
Fisheries

ANIEL J. EVANS
GOVERNOR

ROOM 115, GENERAL ADMINISTRATION BUILDING • PHONE 753-6600
OLYMPIA, WASHINGTON 98504

DONALD W. MOOS
DIRECTOR

April 22, 1975.

Mike Mills
State Planning Division
Office of Program Planning
and Fiscal Management
Olympia, Washington 98504

Dear Mr. Mills:

The Washington Department of Fisheries offers the following comments on the Draft Environmental Impact Statement, Upper Baker Project:

Par. 3.b., pg. ii. The EIS refers to an exposure of 12.8 feet of shoreline which represents a vertical reduction in lake level of 12.8 feet. Much more than 12.8 feet of shoreline would be exposed along those sections of shoreline which are sloping, the amount of exposure dependent on the shore gradient. At lower elevations much of the shoreline is not vertical. This statement does not give a clear picture of shoreline exposure.

Sec. 2.10. Lake spawning for sockeye is not successful because of the receding water levels in Baker Lake during the fall and winter.

Sec. 4.3.3. No mention is made of the effect of increased temperatures on the rate of egg incubation.

Sec. 4.3.5. With the drawdown starting November 1, little relief would be expected for lakeshore-spawning sockeye. Spawning in the artificial spawning beaches is about one-third completed by November 1 and our experience with sockeye in Channel Creek is that sockeye maturing in Baker Lake spawn about two weeks ahead of artificial beach spawners. Spawning in Channel Creek is not spread out over the long period of time as is the artificial beach spawning. Therefore, most spawning in the lake would be completed by November 1.

If future studies by fisheries agencies regarding the impact of the proposed drawdown schedule show an unanticipated adverse impact on beach-spawning sockeye, provision should be made to implement Fisheries' alternative plan or a similar plan.

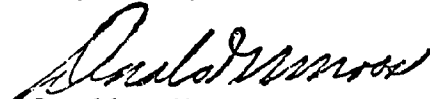
Mike Mills
April 22, 1975
Page 2

Sec. 4.4.1. There is considerable spawning in the mainstem Skagit below Concrete during the October 1-November 15 drawdown period. The additional discharge from the Baker Project may encourage spawning in areas which may be dewatered when discharge is reduced after November 15. This would mean facing the problem of redd loss in the mainstem Skagit as well as Baker Lake.

Sec. 5.1. Comments on paragraph 3.b., pg. ii apply here also.

We appreciate the opportunity to review and comment on this draft statement.

Very truly yours,



Donald W. Moos
Director

April 2, 1975

State of
Washington
Department
of Social & Health
Services



Mr. Mike Mills
State Planning Division
House Office Building
Olympia, WA 98504

RE: Draft Environmental Impact Statement
Additional Flood Control at Upper
Baker Project

Dear Mr. Mills:

We have reviewed the referenced statement and deduce that the project's socio-economic and public health impacts have been inadequately addressed.

The statement intimates an increase in flood plain development at elevations afforded added protection by the proposed project, suggesting a desperate need for public sewers to alleviate the adverse impact on water quality. Development most assuredly will occur in the absence of restrictive statutes, however, it is presumptuous to justify flood plain development by a reduction in flood hazard. The impact of unavoidable flooding on the economic, mental and physical well-being of flood victims and associated infrastructure is immeasurable. We do not support the encouragement of flood plain development under any circumstance and recommend that flood control projects be preceded by mandated land use restrictions.

The impact of increased reservoir drawdown on insect vector propagation has not been discussed by the authors. Vector control measures for shoreline and slough areas should be given in-depth consideration.

Sincerely,

A handwritten signature in cursive script, reading "John H. Laubach".

John H. Laubach, R.S.
Administrative Consultant
Office of Environmental Health Programs

JHL/lr

GOVERNOR
DANIEL J. EVANS

COMMISSIONERS:
JEFF D. DOMASKIN
THOMAS C. GARRETT
KAY GREEN
BEN HAYES
RALPH E. MACKEY
EUSTACE VYNNE
WILFRED R. WOODS

DIRECTOR:
CHARLES H. ODEGAARD



**WASHINGTON STATE
PARKS & RECREATION COMMISSION**

LOCATION: THURSTON AIRINDUSTRIAL CENTER

PHONE 753-5755

P. O. BOX 1128

OLYMPIA, WASHINGTON 98504

March 11, 1975

IN REPLY REFER TO:

TO: Mike Mills, State Planning Division, Office of Program
Planning and Fiscal Management

FROM: David W. Houser, Chief, Environmental Coordination
David Hansen, Chief of Archaeology and Historic Preservation

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT - ADDITIONAL FLOOD CONTROL
AT UPPER BAKER PROJECT

The Washington State Parks and Recreation Commission has reviewed the above-noted document and can find no adverse impact on existing or proposed recreational areas under the jurisdiction of the Commission.

However, as a point of information, it appears that an error has been made on page ii-3b and on page 54-4.3.8. It is stated that a 12.8 or 13 foot vertical drop in the water level will cause about 12.8 or 13 feet of shoreline exposure. This could happen only when the bottom of the lake is a vertical cliff. If the average side slope of the lake bottom near the edge of the lake were 3 to 1, then a vertical drop of about 13 feet would expose about 39 feet, not 13 feet of lake bottom.

Thank you for the opportunity to review and comment on this statement.

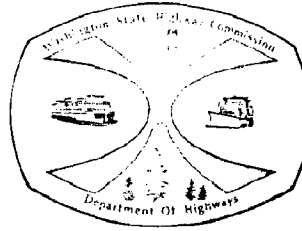
sg

WASHINGTON STATE

HIGHWAY COMMISSION

DEPARTMENT OF HIGHWAYS

Highway Administration Building
Olympia, Washington 98504 (206) 753-6005



Daniel J. Evans - Governor
G.H. Andrews - Director

April 1, 1975

Mr. Mike Mills
State Planning Division
Office of Program Planning and Fiscal
Management
106 House Office Building
Olympia, Washington 98504

Corps of Engineers
Additional Flood Control at Upper Baker
Project
Draft Environmental Statement

Dear Mr. Mills:

Reference is made to your letter of March 5, requesting our review of the draft environmental statement for the above project.

We have completed our review with respect to existing or proposed highways in the area and find no conflicts.

Thank you for the opportunity to review this information.

Sincerely,

G. H. ANDREWS
Director of Highways

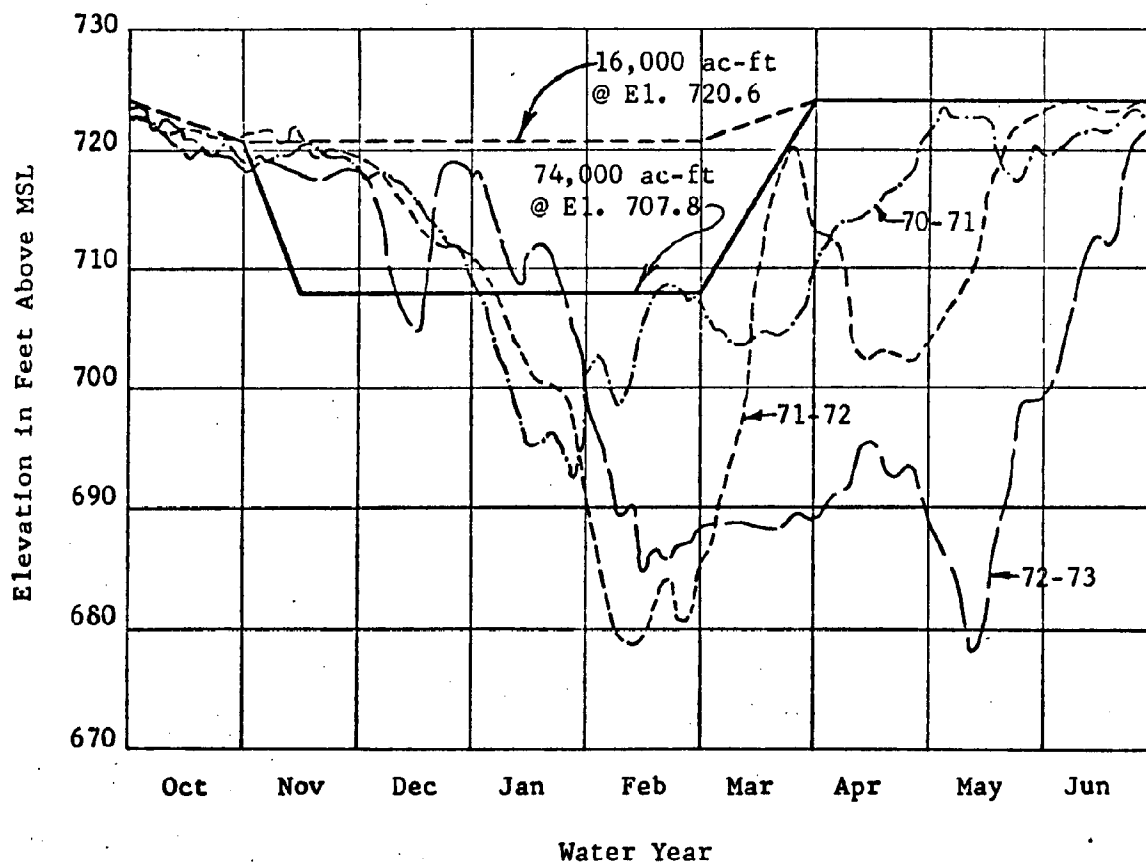
By: H. R. GOFF
Assistant Director for
Planning, Research and State Aid

HRG:eh
RA/RBD

cc: W. C. Bogart

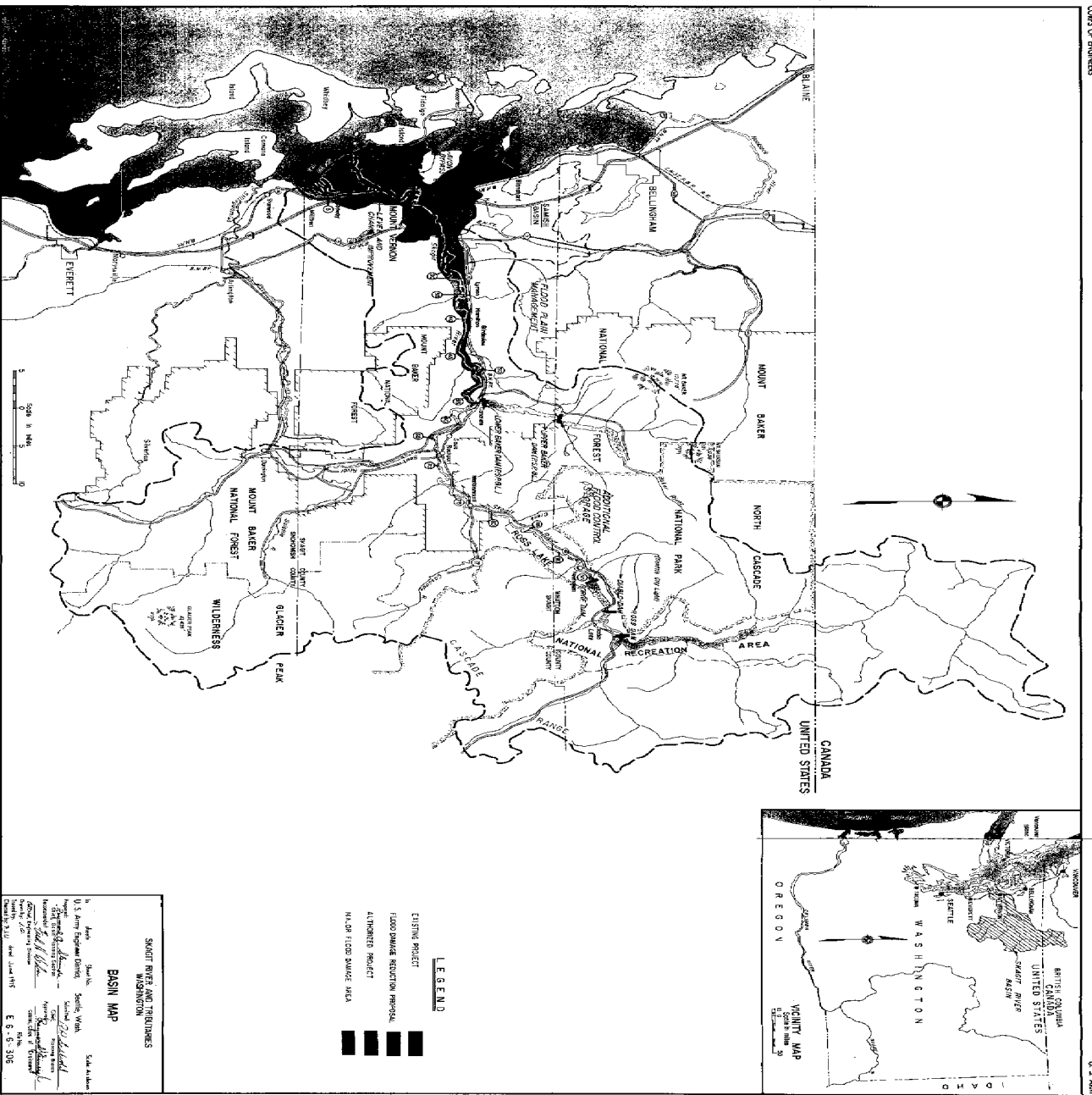
APPENDIX A

FIGURE 1



UPPER BAKER PROJECT RESERVOIR ELEVATION

(HISTORICAL DRAWDOWN AND FLOOD CONTROL
RULE CURVES UNDER 16,000 ACRE-FEET (EXISTING)
AND 74,000 ACRE-FEET (PROPOSED CONDITIONS)



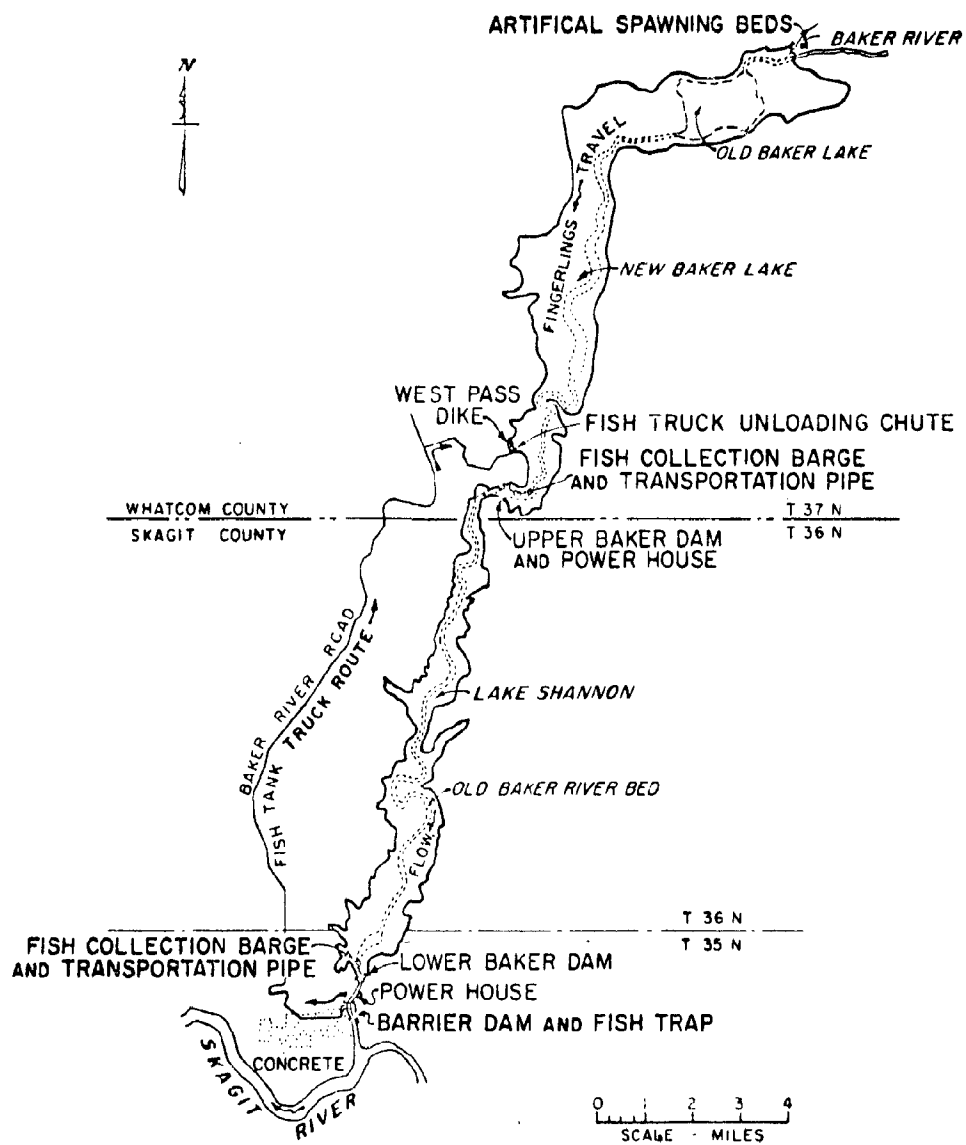


Plate 2

PUBLIC BROCHURE

ALTERNATIVES AND THEIR PROS AND CONS

ADDITIONAL FLOOD CONTROL AT UPPER BAKER PROJECT

AUTHORITY FOR STUDY: Congress through the Flood Control Act of 1962 authorized a comprehensive water and related land resources study covering the major river basins and island groupings which constitute the Puget Sound region. A comprehensive plan, completed in 1971, called for increasing Skagit River flood control through use of reservoir capacity provided by Puget Sound Power and Light Company's Upper Baker hydroelectric power project in addition to the 16,000 acre-feet of storage space now available during the winter flood season. The detailed feasibility investigation completed by the Corps of Engineers was in followup to the comprehensive study and undertaken under the same authority.

PURPOSE OF BROCHURE: Results of engineering, economic, and environmental impact studies are reflected in this brochure, with information displayed on the alternatives considered. The alternative recommended for implementation by the Seattle District Corps of Engineers is presented along with the basis for this selection.

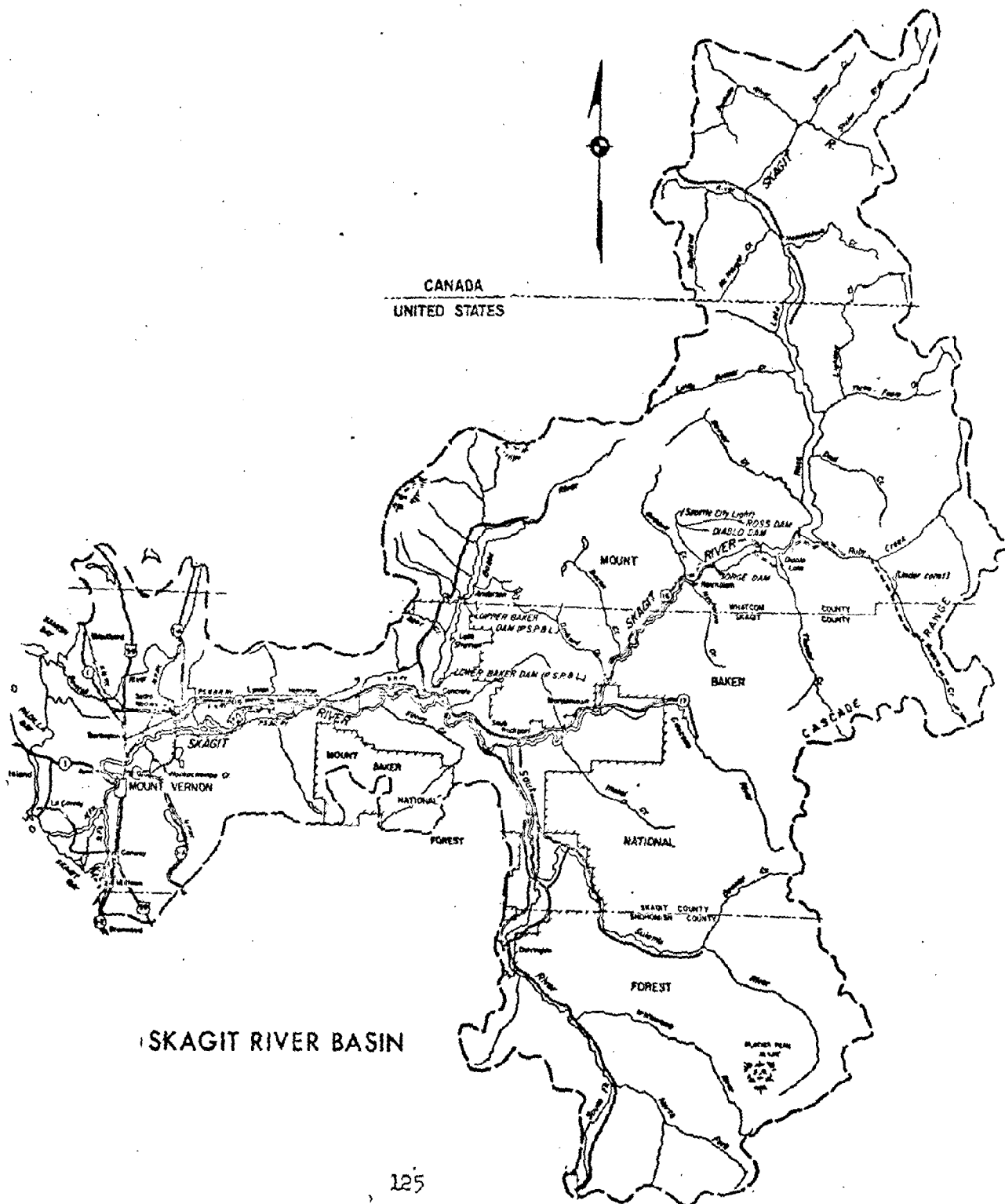
METHOD (OPEN FISHBOWL PLANNING): Previous drafts of this brochure were distributed to all known interested parties as the study progressed. Their review and comments were invited of the information presented on the alternatives, including social and environmental effects. Views were also sought on the tentative study findings contained in draft #4, distributed in March 1975. All comments received were considered in preparation of the District Engineer's final report.

FRANK J. URABECK
Study Manager
(Telephone 206-764-3611)

SEATTLE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
4735 EAST MARGINAL WAY SOUTH, SEATTLE, WASHINGTON 98134

I N D E X

	<u>Page</u>
Map	ii
Tentative Recommendation of Seattle District	1
Summary of Economic, Social and Environmental Effects of Recommended Alternative	1
Rationale for Elimination of Other Alternatives	4
Scope of Study	5
Study Action to Date	5
Future Study Action	6
Background	6
 ALTERNATIVES	
1 - Do Nothing	10
2 - Flood Plain Management Alone	12
3 - Flood Plain Management with Additional Flood Control Storage at the Upper Baker Project	16
 Agencies and Groups Contributing Facts to the Study	
Plan for Public Involvement	20 21



RECOMMENDATION OF SEATTLE DISTRICT

The Seattle District, Corps of Engineers, recommends implementation of Alternative 3, FLOOD PLAIN MANAGEMENT WITH ADDITIONAL FLOOD CONTROL STORAGE AT UPPER BAKER PROJECT, on the basis that this proposal is responsive to locally expressed Skagit River basin needs and is consistent with comprehensive plans adopted by Skagit County and the Pacific Northwest River Basins Commission.

Land use zoning, development restrictions, flood proofing and early flood warning are flood plain management elements of this alternative which would be continued by Skagit County and the State of Washington. Federally subsidized flood insurance would also remain available to county residents. Improved Skagit River flood control below Concrete, Washington, would be achieved through changing the operation of Puget Sound Power and Light Company's (Puget Power) Upper Baker hydroelectric project (see map, page ii). Baker Lake would be lowered to provide a total of 74,000 acre-feet of flood control storage between 15 November and 1 March each year. This includes 58,000 acre-feet, in addition to the 16,000 acre-feet now provided by Puget Power as compensation for natural valley flood control storage lost by project construction. The level of flood protection would be increased for the nearly 100,000 acres of Skagit River lying below the mouth of the Baker River. Flood control use of additional storage space would begin when Skagit River is forecast to reach 90,000 c.f.s. at Concrete (84,000 c.f.s. at Mount Vernon). (See page 16 for more details on alternative 3.)

SUMMARY OF ECONOMIC, SOCIAL AND ENVIRONMENTAL EFFECTS OF RECOMMENDED ALTERNATIVE

The proposed increase in flood control at Upper Baker project would require no construction and only a change in project operation. The environmental effects of the proposed action are anticipated to be minor in most respects. In the discussion of impacts which follows, an attempt was made to isolate as many potential effects as possible, even if they seemed to have only low probabilities of occurring.

Population and Community Growth. The proposed action is not expected to have significant effects on population or community growth within the flood plain. New job opportunities would not be created as a direct result of the project, thereby limiting project effects on future population immigration. Although increased flood control capability has the potential of creating increased development pressure on flood plain lands, especially those close to urban areas and those now protected by dikes and levees, this pressure is expected to be minimal. To the extent that any new lands are brought into intensive development because of added flood protection, a potential for greater personal and economic losses would exist when future major floods do occur. However, the application of stringent flood plain management techniques and flood plain zoning by Skagit County, as called for in the recommended plan, should reduce the likelihood and severity of such losses.

Community Services and Facilities. The cost of flood-related community services and facilities should decrease with implementation of the proposal. A portion of local and state funds which would otherwise be appropriated for flood fighting, rescue and repair may become available for the improvement of other community services and facilities.

Housing. With a decrease in the severity of flooding, homes would incur less damage, thereby allowing the homeowner to invest more in home improvements. As a result, the general quality of housing in the areas affected would increase.

Displaced Persons. Because the proposal would not require construction or acquisition of lands, no displacement of citizens would be required for implementation. The probability of persons being displaced by flooding would be decreased.

Recreation. The proposed action should have only minimal effects on recreational use of the Baker Lake area. Fishing and other recreational uses of the reservoir area, such as camping and picnicking, generally conclude shortly after Labor Day of each year. As the increased draw-down will not begin until 1 November, impacts on lakeshore use for recreational purposes would be limited.

Health and Safety. By decreasing the severity of flooding in the lower Skagit Basin, associated public health problems should decrease. The project is aimed at minimizing the occurrence of severe floods which constitute a public health threat.

Employment and Income. Because the proposed action would not require construction, local employment or income levels would not be impacted to an assessable degree. Temporary disruption of employment due to flood repair would decrease slightly.

Property Values and Tax Revenues. The proposed action would have a slight impact on residential and agricultural property values. Permanent residences and farms damaged by past floods or structures now located in the flood plain could increase in value somewhat. The impacts of flood protection on commercial and industrial property values are expected to be moderate. Property tax revenue may rise to the extent that assessed valuation of all affected property increases.

Local Government Finance. There would be no increase in non-Federal costs associated with this proposed plan. Benefits accruing to local governments would occur as a result of decreases in damage to public facilities.

Business and Commercial Activity. A relatively small portion of land within the flood plain is used for industrial purposes. Because there would be only a partial reduction in flooding frequency, industrial expansion in the flood plain as a result of the project is not expected to occur. The project would, however, provide increased protection to existing industry in the flood plain and thereby reduce potential future flood damages.

Agricultural. The agricultural sector of the economy would realize economic benefits as a result of the proposed action. Average annual monetary benefits accruing to farmers over the 100-year study period are estimated at \$338,000. This may induce a minor increase in agricultural development of the study area as lands could be put to more intensive agricultural uses.

Water Quality. Water quality of the Skagit and Baker Rivers is generally regarded as excellent. The Washington State Department of Ecology has classified the Baker River as AA, extraordinary. The Skagit River is classified as A, excellent, from its mouth to river mile 17 (Mount Vernon), and AA, extraordinary, from river mile 17 to the Canadian border. Releases from Baker Lake are expected to increase an average of about 1,900 c.f.s. over existing conditions during the period of additional drawdown between 1 and 15 November of each year. These higher flows should not change the quality of water in the Skagit system now regarded as excellent or extraordinary, and may improve the water quality of the lower reaches of the Skagit River through increased flushing and by maintaining the content of dissolved oxygen.

Flora. Existing vegetation adjacent to the reservoir pool is not expected to be affected by drawdown operations. However, the potential for abrasion of reservoir shoreline may decrease due to the proposed drawdown, and vegetative cover in some areas may then re-establish itself.

Fisheries Resources. Present reservoir drawdown at the Upper Baker Dam results in some sockeye salmon redd losses at higher elevations. Because Baker Lake is nearly full during the start of the spawning season in early fall, some sockeye salmon spawn in lakeshore gravels at elevations above 700 feet and as high as 720 feet. Lakeshore spawning occurs when the artificial spawning beaches are filled to capacity, which happens about once every 2 to 4 years. When lakeshore spawning begins before drawdown, some eggs at higher elevations are left exposed and consequently die. By drafting Baker Lake from elevation 720.6 to elevation 707.8, a rate of about 0.8 feet per day during 1 to 15 November, fish that otherwise might have spawned at the higher elevations would be discouraged from doing so. Because the proposed plan would also result in earlier drawdowns than has been the case in the past, there is a potential for further reductions of present spawning and redd losses. As lake elevations dropped, fish would seek out and spawn in other natural spawning streams.

Fauna. As reservoir levels would not be increased beyond those currently in use, and since no further construction would be needed to implement the proposed drawdown, impacts to wildlife resources are expected to be negligible.

Erosion. Baker Lake would be subject to increased levels of shore erosion due to the exposure of additional land area during the reservoir drawdown period of 1 to 15 November of each year. The drawdown schedule

coincides with the wet season beginning in October and November and lasting from six to seven months. While the climatic and soil conditions of the area would contribute to additional deposition of silt and debris downstream and produce additional scouring of the exposed lakeshore, the overall impacts of these changes in relation to water quality, fish habitat and marine vegetation are expected to be minimal.

Visual Landscape. Earlier reservoir drafting of about 13 feet would expose lake bottom consisting of rotting tree stumps, rock outcroppings and mud flats, sooner than now is the case. The recreational experience of those using the reservoir at these times would be diminished. However, this impact is expected to be minor due to the normally low recreational use of the area during months when reservoir drafting is scheduled to occur.

Power Losses. The power generating capacity of the Upper Baker project would be reduced by changes in operation necessary to provide increased flood control. Power losses would consist of energy losses and capacity losses. Energy loss would result when water which ordinarily would be passed through the power units is routed over the spillway to make storage space available for flood control. Capacity loss would be realized because flood regulation would require reservoir drawdown which reduces hydraulic head available for power generation and results in reduced operating efficiency for generating units. Average energy loss during the flood control storage period is estimated to be 2.681 megawatts or 1.117 megawatts annually. Maximum capacity loss during this period would be 6.3 megawatts. Puget Power would be reimbursed for power losses resulting from the provision of additional flood control storage space through replacement power from the Bonneville Power Administration (BPA). The value of net power losses in terms of revenue foregone by the Federal Government in providing replacement power would be \$56,000 annually, based on rate schedules in effect in April 1975. However, BPA itself would be fully compensated in that annual revenues foregone would be considered a nonreimbursable (power) operation and maintenance account of the Chief Joseph Dam, Rufus Woods Lake, Washington, project. Although the proposed operation change would reduce the Northwest's ability to meet projected power demands, this reduction is relatively insignificant.

RATIONALE FOR ELIMINATION OF OTHER ALTERNATIVES

Other alternatives, which were considered during the study, are described below and the reasons given for their elimination. These proposals are discussed in more detail on pages 10 and 12.

Alternative 1 - DO NOTHING. This would have involved relying only on existing flood control facilities, including levees and upstream storage at Ross project for flood protection with no effort made to stem the growth of future flood damages through management practices. Alternative 1 was presented in the first three drafts of the public brochure as a possible option. However, as the State of Washington through its Department of Ecology and Skagit County through its Planning Department are actively engaged in implementing existing and recently adopted State laws which control development in flood hazard areas, this alternative was not given further consideration subsequent to the public meeting held in April 1973.

Also, as shown on page 11, the vast majority of those who responded to previous drafts expressed opposition to this proposal.

Alternative 2 - FLOOD PLAIN MANAGEMENT ALONE. Reliance would have remained on existing flood control facilities; but in addition, management measures including land use zoning, development restrictions, early flood warning, etc., would continue to be employed to reduce the flood damage growth potential in the Skagit Basin. Flood insurance, while made possible by proper local implementation of land use management practices in flood hazard areas, would not reduce damages but merely provides a means of compensation to the affected property owner. Flood plain management is required, however, in order to qualify for Federally subsidized flood insurance. Alternative 2 would be effective in reducing flood damages to new developments but would not significantly mitigate damages to lands and improvements already located on the flood plain. As Skagit County has strongly expressed a desire for higher level flood control and general support has been indicated by responses to past brochure drafts for additional flood protection, this alternative was deemed to be inadequate in itself and not responsive to basin needs. However, flood plain management has been included as part of the selected alternative 3.

SCOPE OF STUDY

Studies were limited to determining the feasibility of providing additional flood control at Upper Baker project consistent with the project's Federal Power Commission (FPC) license. Also considered as an alternative throughout the study was flood plain management alone.

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service late in the study asked that flood control drawdown occur earlier than necessary for flood control in order to benefit Baker Lake salmon production. This earlier drawdown would increase power losses and, therefore, would have to be justified by fishery enhancement benefits. No current provision exists in the FPC license for such a project operation change. Because of this and the lack of data on fish production, the Corps study did not evaluate the early drawdown proposal. However, the Corps of Engineers would support fish and wildlife agencies in any future studies of their proposal, which must be justified on its own merits.

STUDY ACTION TO DATE

Draft brochures were distributed to interested individuals, groups and local, State and Federal agencies in November 1972, April and June 1973, and March 1975, depicting impacts associated with providing additional flood control storage space at Baker Lake. Comments PRO and CON were requested with regard to the alternatives. This is the final brochure containing all comments received on the suggested alternatives. The initial public meeting was held on 25 April 1973 in Burlington, during which the study objectives were outlined. A final public meeting was held on 8 April 1975 in Mount Vernon, during which the recommended alternative was discussed. Detailed engineering, economic, and environmental

impact studies were conducted with input and assistance provided by Skagit County and other State and Federal agencies. Several Studygrams were issued during the course of the study giving information on our progress. Limited distribution of a draft report has been made to the State of Washington, Skagit County and regional offices of interested Federal agencies. Widespread distribution of a draft environmental impact statement took place in February seeking agency and public comments.

FUTURE STUDY ACTION

The District Engineer's report has been finalized, with comments from interested parties considered and incorporated into the report as appropriate. The report, together with this brochure (reflecting comments on draft #4) and the environmental impact statement, will be reviewed by the Corps of Engineers Division Engineer in Portland, Oregon, and the Board of Engineers for Rivers and Harbors and the Chief of Engineers in Washington, D.C. Comments on the recommendations contained in the report will be requested from other Federal agencies and from the State of Washington. These comments will be incorporated into the report, which will then be submitted to Congress.

BACKGROUND

Flood History. The Skagit River valley has a history of winter flooding dating back before 1900. Floodflows have been recorded intermittently since October 1908. Zero damage flow is considered to be 60,000 c.f.s. (measured at Concrete gage). At this discharge, flooding begins between Concrete and Sedro Woolley. However, in the leveed areas below Sedro Woolley, the minimum safe channel capacity is 84,000 c.f.s. Since 1908 this flow has been exceeded 18 times during the winter flood season (October-March). The most recent major flood occurred in February 1951 with a peak discharge of 139,000 c.f.s. at Concrete; 150,000 c.f.s. at Sedro Woolley; and 144,000 c.f.s. at Mount Vernon. The flood remained near its peak for 6 hours at Mount Vernon, a fact which contributed significantly to the severity of the flood damages. During this flood many dikes failed, because they lacked sufficient cross-sectional dimensions to withstand saturation. Tabulated below are flows above 60,000 c.f.s. at the Concrete gage.

30 Nov 1909	260,000	19 Oct 1947	95,200
30 Dec 1917	220,000	27-28 Nov 1949	154,000
13 Dec 1921	240,000	10-11 Feb 1951	139,000
12 Dec 1924	92,500	1 Feb 1953	66,000
16 Oct 1926	88,900	3-4 Nov 1955	106,000
12 Jan 1928	95,500	20 Oct 1956	61,000
9 Oct 1928	74,300	23-24 Nov 1959	89,300
27 Feb 1932	147,000	15 Jan 1961	79,000
13 Nov 1932	116,000	20 Nov 1962	114,000
22 Dec 1933	101,000	22 Oct 1963	73,800
25 Jan 1935	131,000	16 Dec 1966	66,200
28 Oct 1937	89,600	28 Oct 1967	84,200
2 Dec 1941	76,300	1 Nov 1967	64,100
3 Dec 1943	65,200	21 Jan 1968	68,100
8 Feb 1945	70,800	31 Jan 1971	62,200
25 Oct 1945	102,000	16 Jan 1974	79,900
25 Oct 1946	82,200		

Flood Damage Reduction Measures. Existing flood damage reduction measures include a flood forecasting and warning service, flood control storage, levees and flood plain management regulations.

Estimates of impending peak floodflows and expected times of occurrence are prepared by the River Forecast Center in the Portland, Oregon, office of the National Weather Service and disseminated by the Portland River District Office. The River District Office issues emergency and public service teletype bulletins to the National Weather Service office in Mount Vernon, which in turn alerts the county and city officials, newspapers, and transmitting news media. Skagit County Civil Defense Organization is responsible for implementing a flood warning plan.

Ross Dam (see page ii), on the main stem of the Skagit, has 120,000 acre-feet of storage for flood control. This storage was made available in 1953. When flows at Concrete are forecast to reach 90,000 c.f.s., the discharge by Ross Dam is reduced to that required for power generation only. About 16,000 acre-feet of winter flood control storage space is reserved in Baker Lake Reservoir, created by Upper Baker project in June 1959, as replacement for natural valley storage lost when the project was constructed.

Levees extending downstream from Sedro Woolley and sea dikes located on the edge of Puget Sound vary considerably in safe capacity, ranging from discharges expected on the average to recur once every 3 years to discharges expected once every 10 years. The highest level of safe channel capacity is provided along the east bank of Skagit River, protecting Mount Vernon.

A flood plain information report, "Skagit River Basin, Washington," was published by the Corps of Engineers in April 1967. This report has been used by county and State officials to regulate development in flood hazard areas. Legislation providing authority for regulation in these areas

includes the State of Washington Flood Control Zone Act of 1935 and the Shoreline Management Act of 1971. The Skagit River has been designated as Flood Control Zone No. 7 by the Washington Department of Ecology, pursuant to RCW 86.16.

Authorized Corps of Engineers Flood Control Projects.

Levee and channel improvements. The project, authorized by the 1966 Flood Control Act, provides for improving the river channel and raising and strengthening about 34 miles of levees downstream of Burlington. This project is in a deferred status but is expected to be re-examined subsequent to congressional action on the proposed Upper Baker project operation change.

Avon Bypass. This project was authorized by the Flood Control Acts of 1936 and 1966. It includes a diversion channel 8 miles long from near Burlington to Padilla Bay, a 4-mile levee, drainage structures, and widening of the Skagit River for 2 miles. The project is in a deferred status due to Skagit County's inability to assume requirements of local project sponsorship.

Ongoing Related Studies.

Water Pollution Control and Abatement Plan. Under Federal law, Skagit County, like all other parts of the country, is required to submit a water pollution control and abatement plan, in order to qualify for grants for water and sewer improvements. The Department of Ecology is monitoring this study as it is carried out by county and municipal agencies.

National Wild and Scenic River System. The U.S. Forest Service is in the process of finalizing its report on a study of the Skagit River that was undertaken to determine if the Skagit and several of its tributaries meets the requirements for inclusion in the National Wild and Scenic River System. Tentatively, the Forest Service is recommending that the Skagit River from Sedro Woolley to Bacon Creek be classified "recreational" and the entire length of the Cascade, Sauk and Suiattle Rivers be classified "scenic." Alternative 3, as described on page 1, is entirely consistent with these classifications.

Washington Water Resources Program. Under its Water Resources Program, the Department of Ecology is responsible for determining the existing situation, problems, prospective needs, and alternative solutions relative to all water resource matters throughout the State. Much of this activity will be accomplished by meetings with interested citizens and public hearings in the various river basins. Work was initiated in July 1971, and completion of the initial studies is scheduled for 1977.

Land Use Plans.

State Shoreline Management Act of 1971. Skagit County completed an inventory of all affected lands in October 1972, in compliance with the State Shoreline Management Act of 1971. The county shoreline master program is scheduled for publication and submission to the Department of Ecology by September 1975.

Comprehensive Land Use Plans. The Skagit County Planning Department is also reviewing the existing Comprehensive Land Use Plans to determine what changes, if any, are desirable. These plans are available for consultation at the Skagit County Courthouse Annex.

ALTERNATIVE 1

DO NOTHING

DESCRIPTION: Reliance would remain on existing flood control facilities, including levees, dikes and current flood control storage at Ross and Upper Baker projects, with no effort made to stem the growth of future flood damages through management practices (see map, page 15, for flood plain).

EFFECTS:

Plants and animals. Further loss of river habitat.

Water quality. Some degradation.

Recreation. Increased recreation homesite development in flood plain.

Land use. More intensive development expected than would be the case with flood plain regulations.

People. Present population trends would continue.

Flood damage. The approximately 100,000 acres of Skagit River flood plain downstream of the mouth of Baker River, near Concrete, would continue to be subject to the current level of flood risk, with future damages expected to be approximately 17 percent greater over the same economic life as alternative 3 than with an adequate flood plain management program.

ALTERNATIVE 1
Do Nothing

UPPER BAKER

PROS

CONS

PLANTS AND ANIMALS

1. No impact. Would have no additional impact on fish and wildlife recreation. (Dept. Game, F&WS)

1. _____

2. _____

2. Siltation and turbidity. Temporary water siltation and turbidity would continue during each successive flooding and runoff condition. (F&WS)

RECREATION

3. New recreational or access benefits would violate the spirit of the Scenic Highway and National forest. (BP)

3. No new recreational or access benefits would result. (F&WS)

LAND USE

4. Sediment deposited. Flooding of Skagit and Nookachamps leaves beneficial sediment. (DD#21)

4. Erosion. Erosion upstream would continue to increase. (LPC)

5. Applies to only some lands. This alternative would apply only on lands outside of existing flood control zones. (Dept. Ecol.) Lack of flood management is the easiest way to insure that the flood plain remain in agricultural and open space use. (BP)

5. Uncontrolled development. Does not provide management guidelines and encourages sporadic development. (Sierra)

PEOPLE

6. _____

6. Only a matter of time before a major Skagit River flood results in substantial loss of life and property. Presently extensive areas of nondiked lands are inundated periodically. (SWCD)

FLOOD DAMAGE

7. Diking helps. Since diking in diking district No. 17 was raised, trees were removed, and bank riprapped after flood of 1951, there has been no trouble. (SF)

7. Impossible solution. This area is already in a flood control zone, and Alternative 2 is already in effect. (L. St. John)

8. _____

8. Studies should be made. Flooding problem is due to the Sauk and Suiattle Rivers. (DD#14) Studies should be made on how to minimize flooding in the Skagit Valley. (SVG) Flood control is a must. (SE)

9. _____

9. Lower valley unprotected. Offers no protection to lower valley if damage occurs. (Dept. Ecol., Dept. Game, LPC, F&WS)

ECONOMICS

10. _____

10. Costly. Costs of doing nothing would exceed benefits. (DD#21) All that is needed is to clean up the river, especially in the vicinity of the Burlington Northern Bridge between Mt. Vernon and Burlington, and make inexpensive commonsense repairs. (DD#14)

OTHER COMMENTS

11. _____

11. _____

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE

ALTERNATIVE 2

FLOOD PLAIN MANAGEMENT ALONE

DESCRIPTION: No additional flood control structures would be constructed. Existing levees would be maintained and Ross and Upper Baker storage projects continued to be operated as they have in the past. (See map, page ii.) In addition, the following specific nonstructural measures would be relied upon to lessen the growth in flood damage potential.

a. The existing warning system would continue to provide residents of the Skagit Basin advance notice of impending floods in sufficient time to permit them to evacuate some personal property. Flood forecasts are issued by the U.S. Weather Bureau and broadcast by radio and television stations with Skagit County Civil Defense Office responsible for alerting people to the danger of impending floods.

b. Flood proofing would be applied to all future development in the flood plain. In most cases, this would involve placement of fill and constructing the ground floor of structures above the 100-year flood level. The majority of existing developments in flood hazard areas are not expected to be flood proofed due to the expense involved and the availability of relatively inexpensive subsidized flood insurance.

c. New construction would be severely restricted if not precluded in designated floodway areas.

d. The flood insurance program, established under the Housing and Urban Development Act of 1968, as amended in 1973, would be used to make available Federally subsidized flood insurance. Skagit County is presently qualified for this insurance, which applies to one-to-four family dwellings, properties occupied principally by small business, and to the contents of properties of these types. Cropland, industry, and large businesses are not eligible for flood insurance. Other losses, such as interruptions to transportation, also are not covered.

ANNUAL COSTS:

Federal - USCE and HUD	\$248,000 (flood information & insurance)
State of Washington	8,000 (flood plain zoning & permits)
Skagit County	20,000 (flood plain zoning & permits)
Individuals	<u>65,000</u> (flood proofing & insurance)
Total	\$341,000

EFFECTS:

Plants and animals. Existing trends would continue.

Water quality. Existing trends would continue.

Recreation. Existing trends would continue.

Land use. Conversion of agricultural and open space lands to intensive uses would be less than under alternative 1.

Flood damage. Flooding would continue; however, damages to future developments in flood-prone areas would be lessened due to flood proofing, advanced flood warning, and restrictions designed to keep development out of extreme flood hazard areas.

Transportation. Road, highway, and rail traffic would still be subject to disruption during floods.

ECONOMIC ANALYSIS:

Average annual benefits	\$1,058,000 (flood damage reduction & flood insurance payouts)
Average annual costs	\$341,000
Benefit-cost ratio	3.1

ALTERNATIVE 2

UPPER BAKER
Flood Plain Management Alone

PROS

CONS

PLANTS AND ANIMALS

1. Good for all. Most favorable and beneficial to fish, wildlife, water quality, and recreation. (F&WS)

1. _____

WATER QUALITY

2. _____

2. Erosion and sedimentation. The cause of erosion at the upper part of the river and sedimentation at the lower part must be attacked at its source. (LPC)

RECREATION

3. Keeps recreational potential. Preserves recreational potential of lower valley (Dept. Game) and has less effect on environment. (Sierra)

3. _____

LAND USE

4. A master basin control plan. There are integral elements of the total basin program and should be continued and expanded where practical (Dept. Ecol.), and incorporated into a master control plan. (LPC) Most realistic plan (DD#12, R. Hammond), and already in effect under current legislation. (L. St. John) It is a supplement to Alternative 3. (MBNF)

4. _____

5. Commercial and industrial development. Procludes extensive commercial and industrial developments within flood plain, thus preserving open spaces important for recreation and wildlife (Dept. Game, F&WS), and encourages use of alternative areas above the flood plain. (SWCD, BP) Zoning or outright acquisition of a corridor within the flood plain perimeter for recreational access would allow expansion of fish and wildlife opportunities for benefit of the public (F&WS); also should build more salmon hatcheries so there will be more fish in Skagit River. (DD#21)

5. Decreased use of valley land. (BP) Agricultural operations would be discouraged. (F&WS) (DD#21)

6. Flood management. Provides management planning for flood plain and encourages land uses compatible with flooding. (Sierra) The more secure the flood plain becomes, the more intensive type of land use can be expected, i.e. urban encroachment on farmland. (BP)

6. _____

PEOPLE

7. Investors will be warned. Should serve as a warning to future investors that there is a potential flooding problem. (SWCD)

7. _____

8. _____

8. Insurance. Insurance should be considered as a precautionary measure (Dept. Ecol.), and should not be expected to replace good judgement in locating structures. (SWCD)

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE

ALTERNATIVE 2 (con.)

UPPER BAKER
Flood Plain Management Alone

PROS

CONS

PEOPLE (Con.)

- | | |
|--|--|
| 9. Small governmental subdivisions are subject to pressures, and decisions made under these conditions may not be best in the long run. (SWCD) Involves political decisions difficult to implement. (MBNF) | 9. _____
_____ |
| 10. _____
_____ | 10. <u>An inadequate solution.</u> (SE) Flood plain use accounts for only a small percentage of the total damage potentials. (Dept. Ecol.) |
| 11. <u>Warning system.</u> An improved warning system is needed. (SECD, #12 SW, #12 MV, #21) | 11. <u>May be poor dike case.</u> Might cause less careful dike maintenance, thus increasing potential dangers. (BP) |

ECONOMICS

- | | |
|--|--|
| 12. Least costly solution. (L. St. John) | 12. Costs would exceed benefits. (DD#21) |
|--|--|

OTHER COMMENTS

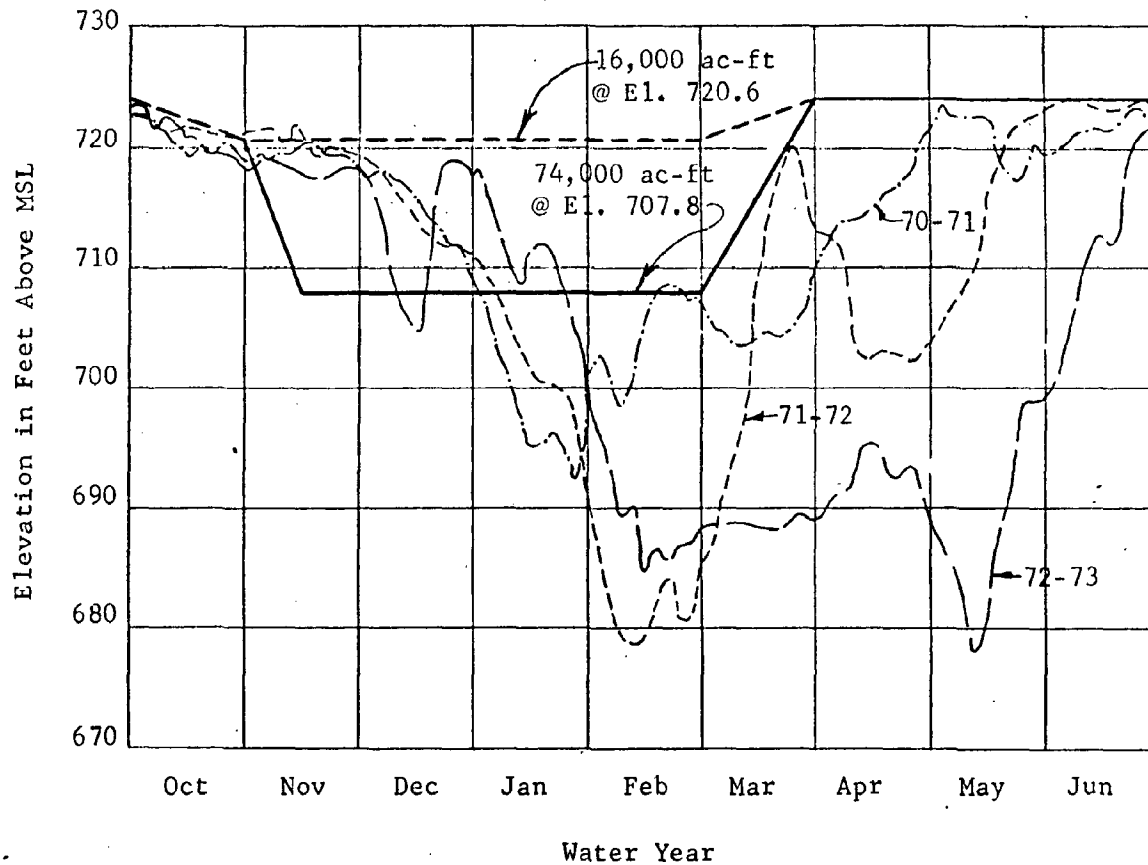
- | | |
|-----------------------------|-----------------------------|
| 13. _____

_____ | 13. _____

_____ |
|-----------------------------|-----------------------------|

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS
AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE



UPPER BAKER PROJECT RESERVOIR (BAKER LAKE)

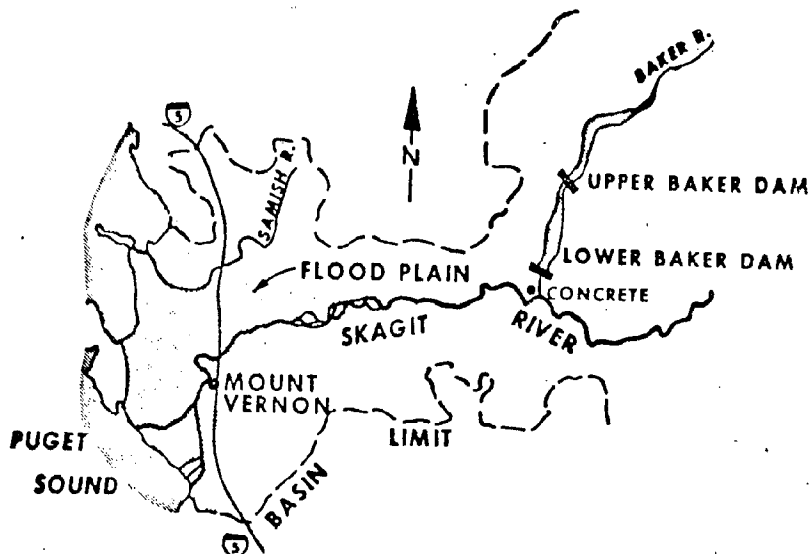
(HISTORICAL DRAWDOWN AND FLOOD CONTROL
 RULE CURVES UNDER 16,000 ACRE-FEET (EXISTING)
 AND 74,000 ACRE-FEET (PROPOSED CONDITIONS)

ALTERNATIVE 3

FLOOD PLAIN MANAGEMENT WITH ADDITIONAL FLOOD CONTROL STORAGE AT UPPER BAKER PROJECT

DESCRIPTION: Flood plain management measures defined under alternative 2 are included in this proposal, which calls for a change in operation of the existing Upper Baker hydroelectric project, owned and operated by Puget Sound Power and Light Company. The Upper Baker project currently provides 16,000 acre-feet of flood control storage, as compensation for natural valley storage lost due to construction of the project. The Federal Power Commission project license allows up to an additional 84,000 acre-feet of flood control storage to be utilized at the project, provided that Puget Power is satisfactorily compensated for the attendant reduction in power production capability. The following alternative volumes of increased storage were examined:

Storage Space (acre-feet)		Minimum Flood Control Pool Elevation
Additional	Total	
84,000	100,000	701.4
58,000	74,000	707.8
50,000	66,000	709.8
40,000	56,000	712.1



The recommended plan calls for an additional 58,000 acre-feet of storage space to be provided by 15 November. The pool would be kept below elevation 707.8 from 15 November, except during an actual flood event, until 1 March. Use could be made of the reservoir's full capacity for hydroelectric power generation by 1 April. See page 15 for the existing and proposed flood control rule curves, including actual drawdowns for 1970-1973.

WITHOUT FLOOD PLAIN MANAGEMENT BENEFITS

IMPLEMENTATION COSTS:

Federal - \$21,000 - Preparation of reservoir regulation manual and negotiation of power loss evaluation agreement.

AVERAGE ANNUAL COSTS:

Actual

Federal - \$68,000 - Federal power revenues foregone in providing replacement power from the Federal system to Puget Power and allowance for administrative costs associated with Upper Baker project flood control operation.

Economic

Federal - \$434,000 - Alternative cost of replacement power and average annual administrative costs associated with additional flood control at Upper Baker project.

AVERAGE ANNUAL BENEFITS: Flood damage reduction - \$1,127,000

BENEFIT-COST RATIO: 2.6 (economic)

WITH FLOOD PLAIN MANAGEMENT BENEFITS

AVERAGE ANNUAL COSTS: \$775,000

AVERAGE ANNUAL BENEFITS: \$2,185,000

BENEFIT-COST RATIO: 2.8 (economic)

EFFECTS:

Plants and animals. Reservoir fishery would not be adversely affected. Additional water, released from the Upper Baker project, during flood control drawdown, would augment Skagit River flows during salmon spawning.

Water quality. Lower reservoir levels during the period of heavy winter rains could increase siltation in Baker Lake and result in higher turbidity downstream.

Recreation. Downstream Skagit River sport fishery could be improved by low-flow augmentation.

Land use. The increased flood protection provided by this alternative would not be sufficient to allow relaxation of current restrictions on intensive developments in flood hazard areas. Therefore, no effect on land use is expected.

Flood damage. Additional flood protection would be provided for nearly 100,000 acres of Skagit River flood plain located below the mouth of Baker River, near Concrete.

Power lost. Hydroelectric power generation capability at the Upper Baker project would be reduced due to the requirement for a lower pool during the winter flood season. This could contribute to power shortages in the Pacific Northwest. However, the relatively small amount of power involved is not expected to significantly impact the overall system. Puget Power would receive replacement power from the Bonneville Power Administration.

ALTERNATIVE 3

Flood Plain Management with Additional Flood Control Storage at Upper Baker Project

PROS

CONS

PLANTS AND ANIMALS

- | | |
|--|--|
| <p>1. Field inspection indicates that this is not a problem. (C of E) Increased flood control storage in Baker Lake will not result in additional impact on the salmon fisheries resource. (Dept. Fish)</p> <p>2. <u>Spawn in Channel Creek.</u> The proposed drawdown might prevent the sockeye from spawning on the subsequently dewatered portion of the beaches where their eggs are killed. As result, the fish will seek out and successfully spawn in Channel Creek. (Dept. Fish, NMFS) Field inspection indicates that this is not a serious problem. (C of E)</p> <p>3. Drawdown times different. Begin drawdown about October 30, end of fishing season, not October 1. (BRRS, Hessel Dahl) Suggest after Labor Day to October 1. It will help sockeye to spawn somewhere else. (NMFS) Starting after Labor Day will have minimal impact on recreational angling in Baker Lake. (SWCD)</p> | <p>1. <u>Fish will be affected by drawdown.</u> Low drawdown would trap fish fry in pits at upper end of lake, exposing them to predation and other losses. (NMFS) Scheduled pool elevation would result in downstream migrants escaping through turbines (F&WS, NMFS).</p> <p>2. <u>Access to spawning may be a problem.</u> Increased drawdowns could adversely affect accessibility of spawning streams. (F&WS, BRRS) Would eliminate or expose shoreline spawning habitat now used by sockeye salmon. (F&WS)</p> <p>3. _____</p> <p>_____</p> <p>_____</p> |
|--|--|

WATER QUALITY

- | | |
|---|--|
| <p>4. <u>No significant impacts on water quality due to the proposed project.</u> (EPA)</p> | <p>4. <u>Siltation and turbidity problems.</u> Holding the reservoir at a low level, especially during the winter months, would expose the shoreline to heavy rains and create a siltation problem and increased turbidity. (F&WS, NMFS)</p> |
|---|--|

RECREATION

- | | |
|---|---|
| <p>5. <u>No effect on recreation.</u> If drawdown occurs in the fall, should not have adverse effect on summer recreation. (MBNF)</p> | <p>5. <u>Drawdown effect on recreation.</u> Need to evaluate recreational impacts due to reservoir drawdown. (Dept. Ecol.) Might affect fishing access in spring. Would decrease recreational and scenic values of Baker Lake (Sierra Club). Further drawdown of the reservoir may cause an adverse effect on recreational potential of the basin. (BRRS)</p> |
|---|---|

LAND USE

- | | |
|---|---|
| <p>6. <u>Important for land-use program.</u> Should be considered an integral component of the program for the entire basin. (Dept. Ecol.)</p> <p>7. Due to only partial reduction in flood hazard and restriction of flood plain management, land use should not change. (C of E)</p> <p>8. Land subject to flooding could eventually be lost due to erosion. (DD#21) Nookachamps area needs protection. (B. Lundvall)</p> | <p>6. _____</p> <p>_____</p> <p>7. <u>Could result in more intensive use of flood plain</u> with resulting loss of open space and green belts. (WEC)</p> <p>8. In case of Nookachamps area, flooding is beneficial. (P. Wilcox)</p> |
|---|---|

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS
AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE

ALTERNATIVE 3 (con.)

Flood Plain Management with Additional Flood Control Storage at Upper Baker Project

PROS

CONS

PEOPLE

- | | |
|--|---|
| 9. Will protect farmlands. Flood control including upriver storage is essential for protection of farmland and existing farm and residential structures in the existing flood plain. This is included in District long-range program. (SWCD, S. Mengler) | 9. <u>Diking</u> . It would be better to improve dike. (BP) |
| 10. _____ | 10. <u>Electric supply reduced</u> . Releases available electric supply at time when need is greatest. (SE) |

FLOOD DAMAGE

- | | |
|--|--|
| 11. <u>Support flood protection</u> . Strongly support this flood protection. (SE, BPW, #12 MV, #17, #20, DD#13, #15, DD#21, Yecman, Hesseldahl, SEC) We would favor even this small amount over nothing. (SWCD) Represents some positive control on flooding. (MBNF) Would provide partial relief. (LPC, Hamilton) | 11. <u>Not enough protection</u> . Only corrects about 8 percent of the total flood damage of the basin. (Dept. Ecol.) Watershed above Upper Baker includes less than 7 percent of area of the Skagit at Mt. Vernon and about 10 percent of runoff volume. This degree of control would be small under severe conditions. (SWCD) |
| 12. <u>Storage will increase</u> . The additional flood storage could make the difference between the disaster or high river stage. (PNKWA) Additional flood storage at Upper Baker will not adversely affect the environmental values of Skagit Valley. (EPA) It is only a start on the overall control program for Skagit, and its benefits will more than justify the costs. (SWCD) | 12. _____

_____ |
| 13. <u>Favor Alternative 3 with improved warning system</u> . (Hamilton) | 13. _____ |
| 14. <u>Flood plain development</u> . Flood control storage in Baker Lake, combined with flood plain management, offers the most acceptable plan. (SWCD) | 14. <u>False sense of security</u> . Encourages development of flood plain for uses incompatible with flooding. (Sierra) Would create a false sense of security which could induce continued building in floodprone areas. (R. Hammond, SWCD) |
| 15. <u>Reduces peak flows</u> . Present operation of Baker Dam has already helped to reduce peak flows (SVG), and flood storage in Baker Lake would be of great benefit to the lower valley. (SC) | 15. <u>Impact on environment</u> . Doubtful that changed reservoir operation would provide noticeable flood control benefits, while contributing to substantial environmental damage and degradation. (F&WS) |
| 16. <u>With the additional flood storage, the authorized levee project will provide adequate protection</u> . (PNWA) With existing storage projects and good dikes below Sedro Woolley, ample flood insurance will exist. (P. Wilcox) | 16. _____

_____ |

ECONOMICS

- | | |
|---|---|
| 17. <u>No large capital costs</u> . Can be achieved without large capital costs. (Dept. Ecol., Hamilton) Cost in relation to benefits appears favorable. (SWCD) | 17. <u>Questionable whether costs would be justified</u> . (SE) A very expensive project (BP), and involves recurring annual cost. (MBNF) |
| 18. <u>Additional flood control at Baker would hold damages to a minimum</u> . (DD#21) | 18. _____ |

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE

ALTERNATIVE 3 (con.)

Flood Plain Management with Additional Flood Control Storage at Upper Baker Project

PROS

CONS

ECONOMICS (Con.)

- | | |
|--|--|
| 19. Economic analysis has determined benefits derived from additional storage in Baker Lake to be economically justified. (C of E) | 19. Negative benefits. Reduced available electrical supply, little change in flood occurrence, encourages development of flood plain, trap fish during drawdown. Appears to offset benefits of additional storage. (BPC) |
| 20. _____ | 20. Flood insurance is available without any increased storage in Baker. (BPC) |

OTHER COMMENTS

- | | |
|---|--|
| 21. Power losses to Puget Sound Power and Light would be replaced in kind from other sources. (DOE) Power loss compensation tentatively worked out between Puget Power, BPA and C of E. No local funding required (C of E). | 21. Would have no influence locally, but would be a minor regional power loss. (DOE, SP) Reduction of hydro capability would have to be replaced by thermal generation. (BPA) Problem exists of reimbursement for power loss and method of dividing costs. (LPC) Districts cannot afford costs of this. (#12 SW, #12 MV) |
| 22. Baker Lake would not be lowered below current fall levels until November, long after recreation season is ended. (C of E) | 22. Tarrs Baker Lake Resort should be reimbursed for loss due to lowering the Baker Lake. |
| 23. Alternative 3 is well formulated and is supported by our department, which acts as the representative of the Governor's office on these matters. (DOE) | 23. _____ |
| 24. Power loss estimates are reasonable and we endorse alternative 3. (PSP&L) | 24. _____ |
| 25. Skagit County agrees to implement flood plain management aspects of recommended plan. (SC) | 25. _____ |

NOTE: Sources of comments, together with abbreviations used, are listed at the end of this brochure.

STATEMENTS BOTH PRO AND CON ON EACH ALTERNATIVE ARE ENCOURAGED FROM AGENCIES, GROUPS AND INDIVIDUALS AS FACTUAL COMMENTS ARE DESIRED RATHER THAN VOTES FOR OR AGAINST THE ALTERNATIVE

AGENCIES AND GROUPS CONTRIBUTING FACTS TO THE STUDY

	Organization	Contact	Provided facts for or commented on brochure dated			
			April 73	June 73	March 75	June 75
	<u>LOCAL</u>					
	Skagit County					
SE	Engineer	L.H. Johnson	X	X		
SP	Planning Dept.	R. Schofield				
SF	Flood Control Council	E. Hanson	X			
SWCD	Soil & Water Conservation District	R.J. Hulbert	X	X		X
CES	Cooperative Extension Service	W.V. Gray			X	
SFB	Farm Bureau					
SPUD	Public Utility District					
SC	Commissioner	H.A. Miller		X		X
	Burlington					
BP	Planning Commission	F. Lubbe	X		X	
BPW	Public Works	A. Lucas	X			
	Sedro Woolley					
	Mt. Vernon					
	Lyman					
LPC	Planning Commission	B. Coggins				
PSP&L	Puget Sound Power & Light Co.	J. Finnegan		X	X	X
	Whatcom County	W.L. McIntyre		X		
	Hamilton	E. Hooper		X		
	<u>Dike Improvement Districts</u>					
#12SW	D.D. #12, Sedro Woolley	G.D. Mapes	X			
#12MV	D.D. #12, Mt. Vernon	L. Ivey	X	X		
#21	D.D. #21	A. Bell	X			
#2	D.D. #2, Mt. Vernon	L. Hughes	X			
#17	D.D. #17	E. Hanson		X		
#15	D.D. #15	R. Reedy,		X		
		P. Summers,				
		E. Summers				
#20	D.D. #20	R.G. Thompson		X		
	<u>Drainage Districts</u>					
DD#21	D.D. #21, Mt. Vernon	P.O. Wilcox	X	X	X	
DD#14	D.D. #14	J. Ball, L.Ovenell	X			
DD#13	D.D. #13	G. Dynes		X		
	<u>STATE</u>					
DOE	Dept. Ecology, Olympia	F. Hahn, K. Kauffman	X			X
	Dept. Fish	Don Moos	X	X	X	
	Dept. Game	J. Ward, E. Reade	X		X	
		Brown				
DNR	Dept. Natural Resources					
PCA	Planning & Community Affairs					
C&ED	Commerce & Economic Development					
NWAPA	N.W. Air Pollution Authority					
SEC	State Ecology Commission					
	<u>FEDERAL</u>					
SCS	Soil Conservation Service, Spokane	L.F. Kehne	X			
MBNF	Mt. Baker National Forest	D.E. Allen	X			
BRRS	Baker River Range Station	R.L. Novy		X		
F&WS	Fish & Wildlife Service	N. Brown	X		X	
BuRec	Bureau of Reclamation					
BPA	Bonneville Power Administration	F.G. Gilkey		X		
NMFS	National Marine Fisheries Service	F. Cleaver	X	X	X	
NWS	National Weather Service					
FPC	Federal Power Commission	M.F. Thomas	X			
EPA	Environmental Protection Agency	C.E. Veirs	X		X	
		Hurlon C. Ray				
	<u>MISCELLANEOUS ORGANIZATIONS</u>					
SYG	Skagit Valley Grange #620, Mt. Vernon	N. McRae	X			
Sierra	Sierra Club	D. Osterhold	X			
WEC	Washington Environmental Council					X
SEC	Skagit Environmental Council	M. Yeoman				X
LWV	League of Women Voters					
PNWA	Pacific N.W. Waterways Association	G. Dynes		X		
	<u>INDIVIDUALS</u>					
	Hammond, R.K., Tacoma		X			
	Kalt, J.E.			X		
	L. St. John		X			
	Yoeman, Margaret					X
	Hesseldahl, Norman					X
	Wilcox, Paul O.					X
	Lundvall, Bob					X
	Menzler, Stephen					X

PLAN FOR PUBLIC INVOLVEMENT
ADDITIONAL FLOOD CONTROL AT UPPER BAKER PROJECT

1	JULY-SEPTEMBER 72	2	OCTOBER 72	3	NOV 72 - FEB 73
	Original alternatives developed by Corps of Engineers and local interests. Public brochure draft #1 prepared.		Brochure draft #1 with all alternatives mailed to interested parties with their comments requested.		Public comments on alternatives evaluated. Alternative 3, Flood Plain Management with Additional Flood Control Storage at Upper Baker Project tentatively selected as best alternative.
4	MARCH - APRIL 73	5	APRIL 73	6	MAY - JUNE 73
	Draft #2 of brochure prepared of all alternatives with PROS and CONS and announcement of apparent best alternative. Brochure draft #2 mailed to interested parties and public meeting announced. Began detailed studies of Alternative 3.		Public meeting by Corps of Engineers. Public comments solicited on brochure draft #2. Alternative announced for detailed study.		Refined and revised brochure draft #3 and mailed to interested parties, with request for comments.
7	JULY 73 - MARCH 75	8	APRIL 75	9	MAY-- JUNE 75
	Continued detailed study of Alt. 3. Study Gram reporting on study status mailed in Nov 73 & Jun 74. Prepared & distributed draft report for limited review. Brochure draft #4 distributed. Final public meeting announced.		Final public meeting held by Corps of Engineers, brochure draft #4 and results of detailed studies discussed and public views received. Agency review comments on draft report and EIS received.		Finalize District Engineer's report. Refined and revised final brochure to reflect public review and comments.

ADDITIONAL FLOOD CONTROL
AT UPPER BAKER PROJECT

Your comments (PRO or CON) on the alternatives listed in the brochure will be appreciated as well as any other comments you may wish to make. Please return this sheet by folding and stapling, and placing in the mail. No postage is required.

ALTERNATIVE

PRO or CON

NOTE: This tear-off sheet was
provided with public brochure
draft #4.

GENERAL COMMENTS

Thank you for commenting!

